

PART C

ANNUAL REPORT
OF THE
MINISTER OF MINES

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDED 31ST DECEMBER

1936



PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C. :
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1937.

BRITISH COLUMBIA DEPARTMENT OF MINES.
VICTORIA, B.C.

Hon. GEORGE S. PEARSON, *Minister.*

JOHN F. WALKER, *Deputy Minister and Provincial Mineralogist.*

JAMES DICKSON, *Chief Inspector of Mines.*

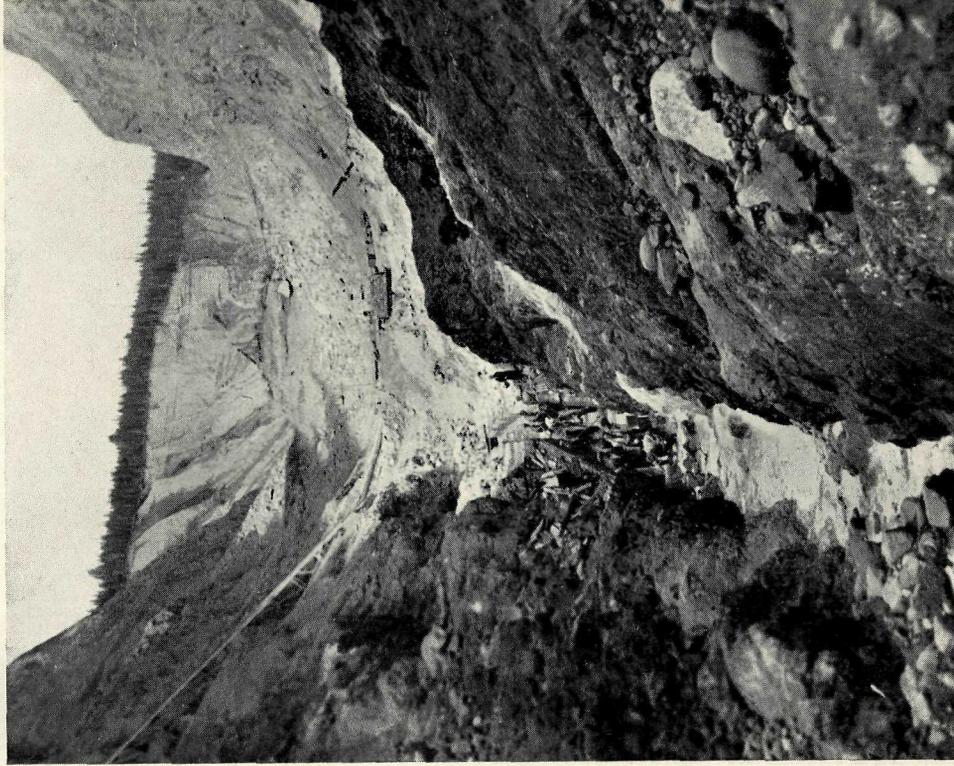
D. E. WHITTAKER, *Provincial Assayer and Analyst.*

P. B. FREELAND, *Chief Mining Engineer.*

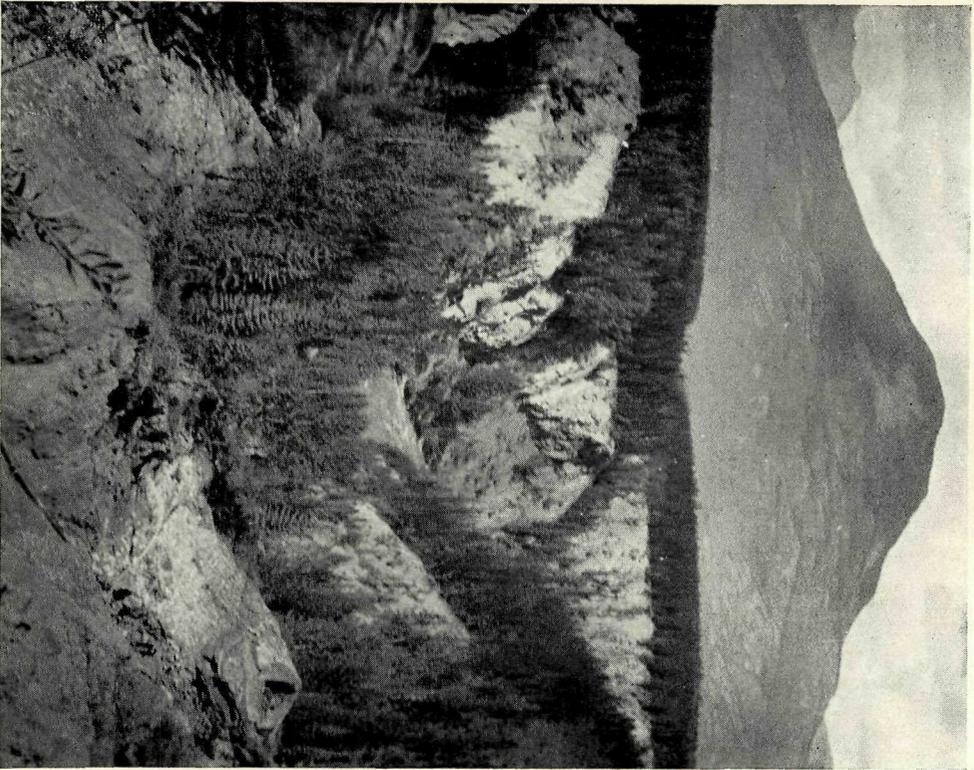
R. J. STEENSON, *Chief Gold Commissioner.*



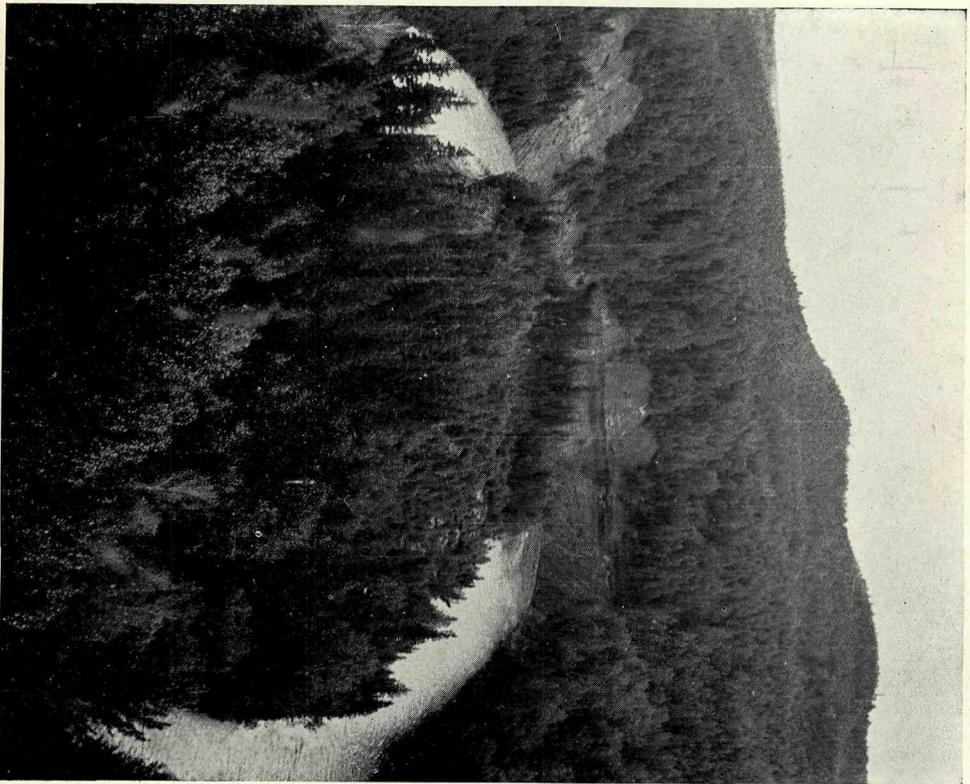
Germanen Mines, Ltd., 1935-36. Pit showing Section of Gravels.



Bullion Placers—looking at Face of Bullion Pit. Clean-up in Progress, October 1st, 1936.



Germanen River below Horseshoe Creek, in Steep Rock-walled Valley.



Hairpin Bend of Cottonwood River. Lease of F. Kruzczak.

PART C.
NORTH-EASTERN MINERAL SURVEY DISTRICT (No. 2).

BY
DOUGLAS LAY.

SUMMARY.

Activity during the year again centred largely on lode- and placer-gold deposits.

Lode-gold production suffered from the interruption to operations at the property of Cariboo Gold Quartz Mining Company, Limited, caused by the loss by fire of the power plant in March. On completion of its new power plant this company increased its rate of milling to 200 tons daily, and the combined daily tonnage milled by this company and Island Mountain Mines Company, Limited, the two producing lode-gold properties in the Cariboo District, now reaches about 325 tons.

An increase in lode-gold mining activity was general throughout the Cariboo District.

Mining activities were confined to individual and small-scale effort in the Omineca Mining Division. The lode-gold possibilities of certain parts of this Mining Division, to which attention has been drawn in the publications of this Department, seem to warrant more active investigation than is now taking place.

Great activity continued in placer-mining, and it is now estimated that the production will be greater than for many years past. The chief contributors were Consolidated Gold Alluvials of B.C., Limited, and Bullion Placers, Limited.

The growth of activity in the Manson section during the year was marked, and quite heavy motor-truck traffic developed in the autumn on the route to this section from Fort St. James. Examination during the year rendered evident that this section is responding well to development, and present activities seem likely to be maintained.

Noteworthy was the adaptation of the Diesel-powered "bulldozer" to placer-mining operations by the Consolidated Mining and Smelting Company, Limited, at its property on Slate Creek. The many purposes to which this useful machine can be put seem likely to meet with increasing recognition in placer operations of a certain kind.

A pilot-mill of 2 tons hourly capacity for the recovery of tungsten was erected at the *Hardscrabble* mine near Wells by Columbia Tungstens, Limited. The management anticipated that it would be possible to commence milling in the late autumn.

Much activity was manifested by prospectors generally. The initiative and energy shown by individual placer-miners and the success they obtained was noteworthy. New discoveries were made of occurrences of lode gold, placer, manganese, and magnetite, of which further mention will be found in the body of this report.

Coal-mining was carried on by F. M. Dockrill at the Bulkley Valley Colliery, and by the Northwest Anthracite Syndicate on Hudson Bay Mountain.

The writer desires to express his cordial thanks for the co-operation and kind hospitality extended by prospectors and mine operators in the course of his duties.

Production from this district for the year is as follows: Ore, 95,419 tons; gold, lode, 36,772 oz.; silver, 7,862 oz.; lead, 763 lb.; zinc, 954 lb.; placer gold, 21,298 oz.

PLACER DEPOSITS.

GERMANSEN RIVER.

Introduction.

A period of ten days was occupied in an examination of placer deposits on this river. Those now being worked are confined to the lower half of the river, but as a correct understanding of these cannot be obtained without consideration of the river as a whole, and surrounding topographic and other features, a short time was spent in an examination of the upper part of the river.

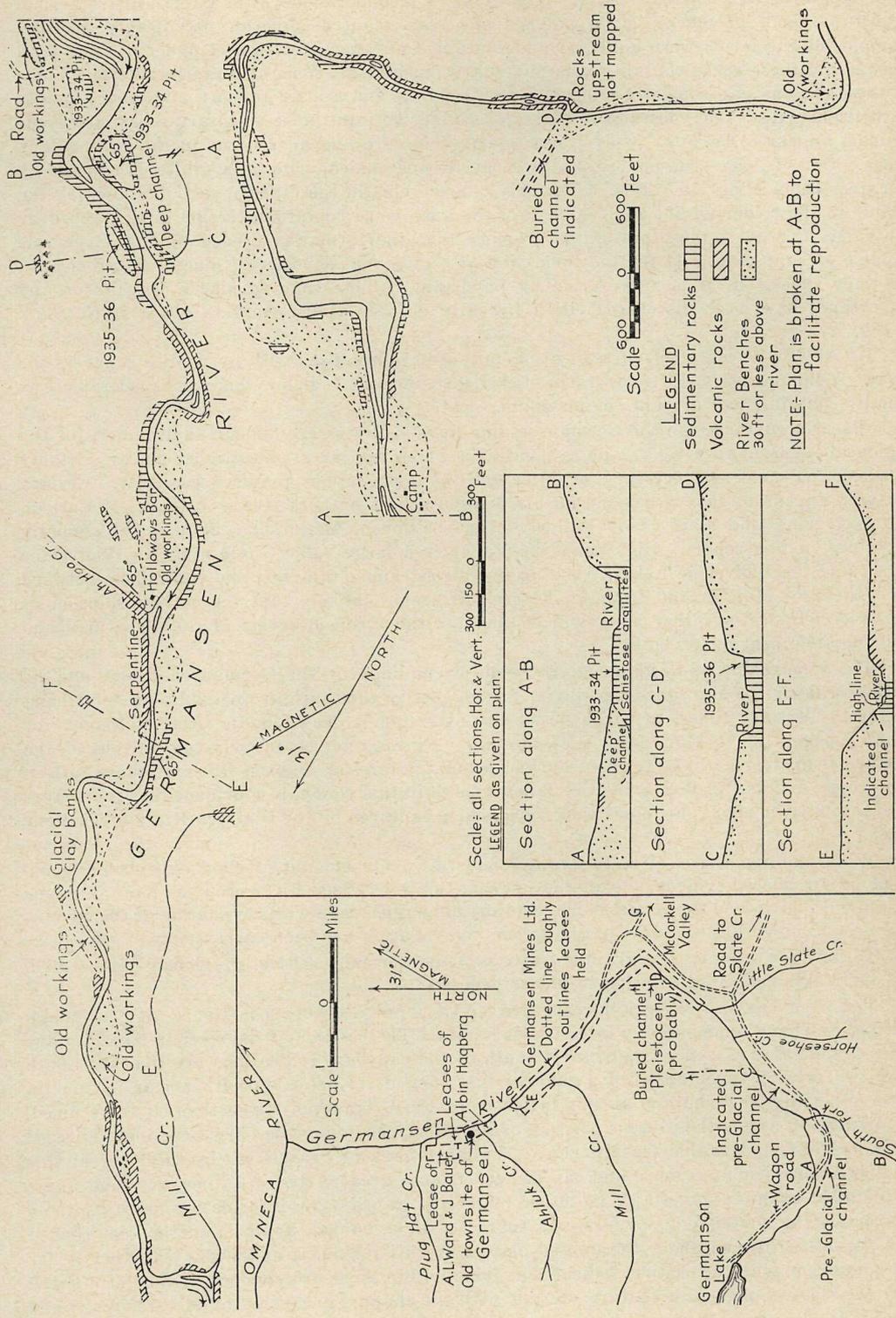
Germansen Lake may be reached by aeroplane from Fort St. James within one hour. Alternatively, the river or lake may be reached by the road now in the course of construction between Fort St. James and the Manson section. In this section there is now quite an extensive wagon-road system connecting Lost Creek, Slate Creek, Germansen River, and Germansen Lake. The road from Fort St. James was not, in the autumn, passable throughout for motor traffic. The distance from Fort St. James to Slate Creek (camp of Consolidated Mining and Smelting Company, Limited) is about 120 miles. Distances from this point to Germansen Lake, and to the camp of Germansen Mines, Limited, on Germansen River, are 9 miles and 8 miles respectively. From the property of Germansen Mines, Limited, the road follows the high ground on the right bank of the river descending to river-level at Ah Hoo Creek. From this point a foot-trail follows the river closely to a foot-bridge just above the old townsite of Germansen, and thereafter follows the west side of the river to its mouth. The grade followed as far as Ah Hoo Creek is easy, and this part of the road could with little difficulty be made passable for motor traffic.

The Germansen River rises in Germansen Lake and flows south-easterly for the first 2 miles in a wide valley of mature relief. It then turns sharply north-east to enter a rock canyon about three-quarters of a mile long, with walls rising some hundreds of feet above the river. The South Fork, hardly less inferior in size, joins the main stream below the canyon after flowing on the opposite side of the wide rock-walled valley for a distance of about half a mile. Continuing for $4\frac{1}{2}$ miles, the river makes another sharp turn to flow north-westerly to its confluence with the Omineca River. The upper part of the north-westerly-trending stretch of the valley is wide and the relief mature, save that numerous gravel-covered rock benches occur in this part. In the vicinity of Mill Creek the valley narrows and the river below this point is confined in a canyon about $2\frac{1}{2}$ miles in length, from which it emerges to enter the wide valley of the Omineca River. For the most part, the river-valley is incised to a depth of about 250 feet, and the region adjacent to the river is in main well timbered save in certain parts. The following topographic features are deemed likely to have an important bearing on placer occurrence: (A.) The deep rock canyon, 2 miles below Germansen Lake. (B.) The wide valley of mature relief, in which the South Fork is contained. The direction of this valley coincides so closely with the north-eastward-trending part of the Germansen River Valley that the narrow cleft forming the canyon by which the Germansen River enters it is relatively inconspicuous. (C.) About 1 mile down-stream from the mouth of the South Fork there is a gap in the rock walls of the valley and an extensive high bank of gravels occurs on the left bank of the river. Immediately above an extensive upland plateau-like area, dotted with many small lakes and muskegs, trends northward, west of the river. On the south side of the river at this point sliding glacial banks cause much trouble to the ditch-line of Germansen Mines, Limited. (D.) The local sharp bend of the river about 3,000 feet above the down-stream end of the north-easterly-flowing part. (E.) The wide and shallow depression trending parallel to the river occupied by the lower part of Mill Creek is approximately as indicated on the accompanying map. (F.) Slate Creek Valley. (G.) McCorkell Valley, or "Little Wolverine" Pass, as it was formerly named. (H.) The long canyon below Mill Creek. These features are designated by letter to facilitate reference and are further discussed in subsequent paragraphs.

Time was not available for a detailed examination of the rock formations exposed above Horseshoe Creek. The purpose of the examination was primarily concerned with placer deposits, and of the formations only in so far as they might affect the latter.

It was, however, noted that at the mouth of the South Fork andesitic volcanics are exposed, which show little evidence of structure. Similar rocks are exposed instream on the road at this point. In the canyon 2 miles below Germansen Lake the formation exposed consists of schistose rocks.

From Horseshoe Creek down-stream the formation exposed by the Germansen River consists of alternating bands, usually some hundreds of feet thick, of schistose sediments and rocks believed to be mainly volcanics. These rocks strike about north 75 degrees west and dip mainly south-west, occasionally northerly, at about 60 degrees, and are considered to be of Palæozoic age by the Geological Survey of Canada. The sediments are argillites and limestones. The argillites pass into phyllites and are intruded by an acidic dyke in the 1933-34 hydraulic pit (on the left bank of the river) of Germansen Mines, Limited. The rocks, believed



Germansen River. Plan showing Property of Germansen Mines, Ltd., and Location of Leases. From Company's Plan.

to be volcanics, weather to a rusty-red colour, show frequent evidence of intense hydrothermal alteration, and, in places, large patches of green-coloured mineral, presumably chlorite. Samples of the latter were analysed and contained an amount of nickel under 0.1 per cent. Frequently these rocks contain numerous quartz gash-veins, some of quite large size. Some of these are barren; some are mineralized with pyrite and a little galena; and others mainly with freibergite. The volcanics in places are intrusive into the sedimentary rocks, and some at least appear to be sills. Only a few quartz veins are known to occur in the sedimentary rocks. One of large size, mineralized with pyrite and chalcopyrite, in argillite, is exposed by the river below Plug Hat Creek. The only quartz veins in the Manson section known by the writer to show commercial gold values are the gash-veins containing freibergite, exposed by the river. There is therefore ample evidence that the formation eroded by this river was capable of supplying gold for the formation of commercial deposits of placer on bed-rock in Tertiary times, but it is, however, most important to note that no placer deposits of any importance have been discovered either by early or present-day workers *above Little Slate Creek*.

At Ah Hoo Creek a belt of serpentine quite well mineralized with pyrrhotite is cut by the river. A sample assayed: Gold, trace; nickel, 0.18 per cent.* Below this point placer deposits usually contain small amounts of platinum.

Placer occurrences on the Germansen and Manson Rivers are difficult to decipher, for the region abounds in rare topographical features, which appear at unexpected places. Highly detailed field-work is necessary to interpret the topographic features correctly. Certain features appear to have a bearing on placer occurrences on both rivers—namely, McCorkell, Big Wolverine, and Slate Creek Valleys. The position of McCorkell Valley is subsequently explained in this report. Big Wolverine Valley is a large valley containing Big Wolverine Creek and the Wolverine Lakes, trending north-west and south-east, and continuous between the valleys of Manson and Omineca Rivers. It seems unlikely that the correct solution of placer occurrence on either river will be found without consideration of these features and their possible bearing on both.

The remarkable and similar great bends exemplified by the Germansen River, and its near neighbour the Manson River, invite the suggestion that such are possibly due to stream-piracy in Tertiary times, to which possibility attention is drawn in the Annual Report for 1933 on pages 108 to 110. Such a postulatory view may not be entirely correct, but as the surface of Wolverine Lake is about 30 feet *below* the level of Manson River at the mouth of Dry Gulch, and as Big Wolverine Creek flows north in this valley, it is evident that the waters of Manson River about this point were *very* nearly captured by the Omineca River in Tertiary times.

While the hypothesis of stream-piracy adds a certain amount of clarity to placer occurrence, it is rendered evident by examination that the Germansen River occupied more than one channel in Pleistocene times, and much headway cannot be made with correlation of the various channels occupied by this river until further investigation has been carried out.

To consider the chief topographic features of the Germansen River previously enumerated, and their significance in relation to placer deposits:—

The deep canyon, topographic feature (A), is probably of post-Glacial age, although cutting may have commenced in inter-Glacial times. The position of the river in late Tertiary times is indicated as being immediately south of the canyon. Indications are that the South Fork in Tertiary times occupied a channel just east of its present position near its mouth. After receiving its tributary at this latter point the Germansen River then, it is assumed, cut diagonally across the present position of its valley, occupying the buried channel indicated as underlying topographic feature (C). The large bank of gravels cut by the river at this point is a conspicuous feature and can be seen from a great distance. Time was inadequate for detailed examination, which might or might not afford some information as to depth to bed-rock. The subsequent down-stream course of this channel, apart from the fact that it must lie deeply buried under the upland plateau in this region, is unknown. Whether it has any connection with the channel indicated as lying within the depression occupied by Mill Creek near the river, topographic feature (E), or with the channel uncovered by Messrs. Ward and

* Small percentages of nickel have been found in serpentine rocks from many places in British Columbia.

Bauer above Plug Hat Creek, must remain a matter of conjecture until further investigation has been carried out. The direction of flow of the South Fork, and the maturity of relief of its valley, topographic feature (B), lends considerable colour to the view that this was the stream which worked northward, in Tertiary times, from the Omineca River, robbing a postulated Manson River rising in Germansen Lake and flowing east by way of Slate Creek Valley, topographic feature (F).

The McCorkell Valley, topographic feature (G), is a wide valley of mature relief extending from the Manson to the Germansen River Valley. In the latter the floor of the McCorkell Valley coincides with an extensive flat flanking the right bank of the river and 250 feet above it. According to the stream-piracy hypothesis, this valley was occupied by a northward-flowing stream, and investigation by Germansen Mines, Limited, to which company the matter is of direct importance, points to the likelihood of a gold-bearing channel therein. The point of emergence in the present Germansen River Valley may be indicated by the glacial clay-bank on the right bank of the river about 2,000 feet below Ah Hoo Creek. Kerr* considers it likely that the Manson River at one time flowed northwards through this valley. This view, it should be noted, also postulates a definite channel in the valley.

A sharp local bend, topographic feature (D), occurs about 3,000 feet above the down-stream end of the north-easterly-flowing part of the Germansen River. At this point a gap in the rock wall on the north side of the valley is occupied by a gravel-bank, and the indications are that a former deep channel trends instream. Its exact down-stream course is at present quite indeterminate, but it may have some connection with another deep channel found at the instream edge of the 1933-34 hydraulic pit of Germansen Mines, Limited, on the left bank of the river, shown on the accompanying map, or possibly also with the deep ground apparently discovered by early miners on the left bank of the river at the old townsite of Germansen. This must remain a mere conjecture until further investigation is made.

Topographic feature (H) is essentially indicative of the existence of a buried channel instream in the left bank of the river.

The low-lying rock benches and other benches, and part of the bed of the river, were extensively worked by the earliest miners. Early workers also apparently sensed the significance of high benches near Plug Hat Creek. Following the exhaustion of the more obvious, and doubtless rich, pay-gravels, the region was deserted apparently for the Cassiar District, and lay idle for many years. The ditch-line now used by Germansen Mines, Limited, it is stated, was originally constructed thirty-five years ago by W. Kenton, who also constructed camp buildings close to the present camp of the company, installed a hydraulic plant, and carried out a considerable amount of hydraulicking on the rock-bench ground, on the right bank of the river, in this vicinity. More recently, Ah Lock installed, single-handed, a small hydraulic plant just above the old townsite of Germansen, which has since been operated each year. Operations on a larger scale were commenced in 1931, after investigation by R. C. and A. A. McCorkell, by Germansen Placers, Limited, which company acquired the ground now under operation by Germansen Mines, Limited. The activities of the latter, and the recent discovery near Plug Hat Creek of a large high channel by Messrs. Ward and Bauer, have been the means of directing attention to the potentialities of the placer deposits of this river.

Placer deposits on this river that are now being worked, or have engaged the attention of earlier operators, are of the following types:—

- (1.) Deposits on low-lying gravel or rock benches and in the bed of the river. Most, if not all, of these are of post-Glacial age and form the type of deposit extensively worked by the earliest miners.
- (2.) Deposits on rock benches lying at an elevation of about 35 feet above the river and overlain by much glacial debris.
- (3.) Placer deposits in deeply-buried channels lying entirely without, but *above* the river.
- (4.) Deposits in a channel system, deeply buried, *below* the level of the river.

As previously mentioned, all the most important placer deposits occur in the north-westerly-flowing part of the river. Inasmuch as gold occurrence on this river is indicated as being of strictly local or closely-local origin, the previous fact mentioned quite possibly indicates that in its upper reaches the river does not cut a terrain that is appreciably auriferous.

* Kerr, F. A., Geological Survey of Canada Summary Report, 1933, Part A (page 22A).

It is quite possible that many low-lying benches and parts of the river-bed remain that can be profitably worked. Greater importance, however, attaches to deposits of the types (2) and (3), by reason of the indicated extent of these, their gold content, and the fact that they can be so readily hydraulicked. Moreover, the abundant water-supply that can be made available from this river, and its large tributary, the South Fork, under a good head, renders it obvious that hydraulicking can advisedly be undertaken on a major scale, and therefore at low cost, when sufficient yardage of requisite average value has been proven.

It is rendered evident by examination that the river occupies, almost throughout the length in which placer has been discovered, a post-Glacial channel. Concentrations of placer in the bed of the river and on adjacent low-lying benches, both gravel and rock benches, are apparently due to the post-Glacial waters cutting across a former channel. Among deposits of this class almost completely worked out by the earliest miners may be mentioned "Holloway's Bar" at Ah Hoo Creek, and the very extensive low-lying rock benches which occur on the right bank of the river between Mill Creek and the head of the lower canyon.

Rock benches at and above 20 feet above the river are overlain, usually quite heavily, with glacial material. Immediately overlying bed-rock there is usually a more or less cemented layer of pieces of shattered bed-rock, and fine gravel, overlain by imbricated gravels, some very coarse, derived almost entirely, save for boulders of granodiorite, from local rocks. Resting on the gravels is more or less silt, which is capped by up to 50 feet of boulder-clay, on top of which there is the usual post-Glacial run of gravel. Appearances in one channel, where both rims are exposed, on the lease of Messrs. Ward and Bauer are much the same as those just mentioned. In both cases there are indications that a powerful stream of water has flowed over the bed-rock for a relatively short time in the Pleistocene period. It does not, however, necessarily follow that the rock channel was carved in Pleistocene time, for if the channels were quickly carved in rock they would be gorge-like. High channels may, for instance, have been carved in this part of the river by drainage heading in the McCorkell Valley in pre-Glacial times; the deposits laid down therein being subsequently disturbed by glaciation, and finally resorted in Pleistocene times.

The character of the gold recovered from hydraulicking rock benches at 35 feet above the river on the property of Germansen Mines, Limited, may be described as coarse-flake gold, with a comparatively large proportion of nuggety gold. One nugget weighing 24 oz. was found in 1935. A nugget weighing 2½ oz. was discovered this year in the channel recently exposed on Messrs. Ward and Bauer's ground.

Generally speaking, it may be said that coarse gold features the placers of the Manson section, and its *individuality* indicates its closely-local origin. By individuality is meant that, as is so strikingly evident in the Cariboo District, each creek has its own particular gold which differs in fineness and in other respects from that of a neighbouring creek. Further, the indications are that the gold contents of pre-Glacial channels have been disturbed by glaciation rather than eroded. An exception is Big Wolverine Valley.

There is evidence at several places of deeply-buried channel-segments lying below the Germansen River; near the up-stream end of the property of Germansen Mines, Limited, at the point shown on the map, at the sharp local bend of the river, topographic feature (D); at the 1933-34 hydraulic pit of this company on the left bank of the river; and at the old townsite of Germansen. Some years ago at the last-mentioned point it is stated that a shaft was sunk to a depth of 35 feet below the river, with encouraging results, but ingress of water prevented further work. Little is, however, known of these deep channels.

In the light of present developments, very little correlation is possible in connection with the various channel-segments exposed.

It is evident that the constituents of the gravels overlying the cemented material on bed-rock were derived largely from local rock formations. Foreign boulders are composed almost entirely of granodiorite, indicating a south-eastward movement of the ice-sheet in this region.

This company was incorporated in 1934, with registered office at 716 Hall Building, Vancouver, for the purpose of acquiring and operating placer-mining leases on the Germansen River formerly held by Germansen Placers, Limited. It is understood that the property now comprises sixteen leases covering the bed and benches of the river for practically the entire distance between Little Slate and Mill Creeks, and that two additional leases on the latter creek are under application.

**Germansen
Mines, Ltd.**

The means of access, topographic features and their significance, and the formations exposed are fully described in the introduction to this area, and will not be further discussed, save for brief mention of topographic features designated by the letter assigned to the reference cited.

The types of placer occurrence exemplified on this property are as follows:—

- (1.) Placer deposits on low-lying benches and in the bed of the river.
- (2.) Placer deposits lying on the extensive system of rock benches situated at an elevation of about 35 feet above the river, which are readily amenable to mining by hydraulicking and are probably of greater importance than (1).
- (3.) Placer deposits in a deeply-buried channel system below river-level.

The rock benches mentioned are overlain by glacial deposits and represent former channels. The placer deposits in the bed of the river and on low-lying benches, many of which were extensively worked by the early miners, are presumably due to the concentration effected by post-Glacial waters in cutting across former channels.

With regard to the deeply-buried channels below the level of the river: Definite evidence of a channel below the bed of the river was afforded in the course of hydraulicking in the 1933-34 pit on the left bank, immediately instream from the pit. The up-stream continuation of this channel quite possibly occurs instream from the rock-rim of the river as far as the sharp bend above this point. Topographic feature (D) is presumably the up-stream end of this channel. Topographic feature (E) clearly indicates an extensive channel-segment quite possibly buried wholly instream from, although closely adjacent to, the river, but no evidence of the depth to bed-rock is exposed. The assumed Tertiary channel mentioned in the introduction, and indicated on the map, *may* of course be found on this company's property, but present data are inadequate to enable an intelligent opinion to be formed.

After investigation by R. C. and A. A. McCorkell prior to 1931, this ground was acquired by Germansen Placers, Limited, a company incorporated in 1931. In that year the extensive construction necessary for the installation of a hydraulic plant was commenced. Water was brought in from the head of the canyon, 2 miles below Germansen Lake, and conveyed by flume across the South Fork. The old ditch-line constructed many years ago was repaired and utilized from this point onward. Hydraulic operations were commenced at the end of the 1932 season and continued the following year. In 1934 Germansen Mines, Limited, acquired this property and has since continued operations. (Annual Reports of Minister of Mines, 1932, 1933, and 1935; also Geological Survey of Canada, Summary Report, 1933, Part A.)

At the time of examination in August the company was engaged in hydraulicking gravels overlying a rock bench, situated 35 feet above the river on the right bank, at the point indicated on the accompanying map. A pit had been opened up for a length of 675 feet fronting the river, with an average width of 150 feet. The maximum height of the pit-face was somewhat over 80 feet, and the following succession of strata was exposed from the top downwards: Several feet of post-Glacial gravels; about 50 feet of blue and red boulder-clay; 2 feet of indurated silt; about 25 feet of imbricated gravels; cemented large pieces of shattered bed-rock and fine gravel immediately overlying a hummocky bed-rock of argillite. Gold is contained in the gravels overlying the cemented material, more especially in the coarser gravels; in the cemented material overlying bed-rock; and in the cracks and crevices of the latter. The gold is in the main coarse, both nuggety and somewhat flat in form. A nugget about 24 oz. in weight was recovered in the course of hydraulicking in 1934 on a similar bench up-stream on the opposite side of the river. The pebbles and boulders in the gravels overlying the cemented material are almost entirely of local origin. Foreign boulders are almost entirely of granodiorite.

An important feature in regard to the age of the gravels is exhibited in this pit and also in the up-stream pit. Joints from 2 to 3 inches in width in the bed-rock extend upwards through the gravels, but not through the boulder-clay. These joints are filled with fine silt, proving that they were opened *after* deposition of the gravels. The joints are assumed to have been opened by frost-action, evidence to the contrary being absent; therefore the gravels must be pre-Glacial or early Glacial.

The up-stream continuation of this channel seems likely to be of considerable length, as rock flanks the river for about 3,500 feet up-stream from this point, and where the rock rises 35 feet or more above the river the channel may lie instream. Although the up-stream part

has been worked to some extent by earlier operators, there is much to suggest that this work did not penetrate sufficiently far instream. The down-stream extent, likewise the width of the channel, is as yet unknown. This channel is of particular interest because the extensive flat, previously mentioned, flanks the bank of the river in this region at an elevation of about 350 feet. There is much to suggest that at one time McCorkell Valley was occupied by a stream of water. About 750 feet instream from the pit, and 200 feet above its floor, a slough is situated on the flat mentioned, and immediately behind the slough volcanic rocks forming the valley-rim are exposed. There is therefore plenty of room for a channel of considerable width at this point, which may be near the junction of two channels. Valuable information can readily be obtained by piping in such a way as to cross-section the channel. A possible point of emergence for a channel on this side of the river is indicated by the glacial clay-banks on the right bank of the river about 2,000 feet below Ah Hoo Creek.

Another point of particular interest is the region on the left bank of the river about 1,200 feet below Ah Hoo Creek. A high-line has been set up at this point to mine a low-lying bench, on which the values are stated to be good, which flanks the left bank of the river. Behind the low-lying bench argillites and volcanic rocks rise sharply to a height of 40 feet, and on these rest glacial gravels which slope steeply to an extensive flat 200 feet above the river. The width of the flat is about 500 feet. It extends up-stream for a considerable distance and down-stream merges in a wide depression parallel to the river, occupied by the lower part of Mill Creek (this creek is incorrectly shown on existing maps, but its approximate position is indicated on the accompanying map). There is every indication that a former channel of the river lies buried instream at this point for a considerable distance. Save locally, its exact course cannot be determined from present exposures, nor is it known at what depth bed-rock lies. The company has installed a pipe-line and constructed a ditch-line for conveyance of water from Mill Creek to supply wash-water for their high-line operations. On completion of the latter it is their intention to commence hydraulic operations at this point.

The company derives its main water-supply from the Germansen River at the head of the canyon above the South Fork. From the intake the water is conveyed by ditch and flume for several miles to the point of use, where the head at present is about 200 feet. There are certain points on the ditch-line where much trouble is experienced each year, especially in spring, owing to sloughing of banks. While an excellent water-supply is available, only a part is utilized. While the writer has not full information of the exact recoveries effected to date, judging from the results secured last year, and in view of the potentialities apparent, there would seem to be every justification for hydraulicking up to the maximum capacity of the existing ditch-line. At the time of inspection only one monitor with a 4-inch nozzle was in operation. More active hydraulicking could readily proceed simultaneously with the high-line operations just started. It is understood that the improvements in the ditch-line necessary to accomplish the objective mentioned are under consideration by the management.

Two leases, held by Albin Hagberg, are situated at the old townsite of Germansen, and cover mainly the ground on the left bank of the river for a distance of about 1 mile, as shown on the accompanying map. The property is reached by a foot-trail from the end of the road from Slate Creek to Ah Hoo Creek, which follows closely the right bank of the river to a foot-bridge across the latter at the upper end of the property.

The chief topographic feature of the up-stream lease is a long and narrow rock bench, about 20 feet above river-level, flanking the left bank of the river in the long canyon in this region. At the down-stream end there is an embayment; the rock bench merges in a gravel bench at the same level; and the river swings sharply east, entering a narrow rock canyon with vertical walls.

Instream, the flat is terminated, save at the embayment, by steep banks of glacial debris which rise to the plateau-level. In the immediate vicinity of the embayment there is a steep rock-outcrop continuous with the glacial banks. The right bank opposite the rock bench rises steeply from the river's edge and is covered with timber. The remainder of the ground except the rock bench is also well timbered, save locally.

The formations exposed consist of intercalated schistose sediments and metamorphosed volcanics. The latter contain some quartz gash-veins exposed on the rock bench. The former consist of cream-coloured limestone and argillite.

The rock bench undoubtedly represents a segment of a former channel, but at the lower end, where, as stated, the rock bench merges in a gravel bench at the same level, there is apparently a still deeper channel closely adjacent. It is stated that a shaft was sunk at this point by early miners to a depth of 35 feet, considerably below the river-bed, and that good values were struck in gravels, although ingress of water prevented further work. The embayment and the existence of a rock-rim instream, and other topographic features also, indicate that a channel lies buried instream on the west side of the canyon-wall in this region. The level of this rock bench is considerably below that of the bed-rock of the channel about 80 feet above the river recently uncovered south of this point on the lease of Ward and Bauer.

The lower part of the rock bench was overlain apparently by post-Glacial gravels which were extensively worked by early miners. The upper part, however, is overlain by a great thickness of glacial debris and boulder-clay.

The ground was acquired originally by Ah Lock, who in 1926 installed, single-handed, a small hydraulic plant, water being derived from the creek named on the map Ahluk Creek. Small-scale hydraulic operations have been subsequently carried on for some years, both by the original owner and by the present owner, who acquired the property in 1934. (Annual Reports of the Minister of Mines for the years 1927, 1933, and 1935; also "Placer-mining in British Columbia," Bulletin No. 1, 1931.)

At the up-stream end the bench has been piped off over a river-frontage of about 275 feet, and to an average distance of about 75 feet from the river. At the up-stream extremity the rising rock indicates the end of the channel-segment at this point. Topographic indications do not suggest a great extent of profitable ground instream. The pay-gravels immediately overlie bed-rock and are heavily overlain by glacial debris and boulder-clay.

The gold occurs chiefly in coarse flakes, although some coarse nuggety gold has been found. It is understood that the ground has proved quite productive.

The lower part of the bench, so far as it is known, was worked off largely by early miners. It is difficult to appraise the potentialities of the deep ground, which, as mentioned, lies buried instream from the river, at the lower end of the rock bench on the lower lease.

This lease is situated immediately south of Plug Hat Creek on the left bank of the river at the top of the wall of the canyon in which the river is confined.

Lease of
A. L. Ward and It is reached by a foot-trail from the end of the wagon-road at Ah Hoo Creek.
J. Bauer. The chief topographic feature is the rolling plateau-like surface which characterizes the top of the rim of the river-valley in this region. The ground is covered with light timber. Here is a large channel, buried to a depth of about 135 feet, with bed-rock about 80 feet above the river-level. Both rock-rims of the channel are clearly exposed and the width from rim to rim is about 475 feet. The east rim of the channel is immediately adjacent to the canyon in which the river is confined. The down-stream continuation of the channel is clearly exposed by Plug Hat Creek, which cuts across it, but there is no obvious indication of its position up-stream. The rock formation exposed in the pit is schistose argillite.

The potentialities of gravels overlying the rock instream from the canyon in this region were apparently perceived by early miners, who brought in water from Plug Hat Creek by ditch-line for the purpose of washing them. The extent of the old workings seems to indicate that good values must have been found. In recent years very little work was done until the ground was acquired by the present owners in 1935, who installed a hydraulic plant that year, conveying water from Plug Hat Creek by utilizing the old ditch-line. The continuation of operations this year resulted in exposure of the channel. (Annual Reports of the Minister of Mines for the years 1927 and 1935; also "Placer-mining in British Columbia," Bulletin No. 1, 1931.)

Although bed-rock is not actually exposed, the slope of the rims indicate that it is not likely to be more than a few feet below the floor of the pit. The width of the channel from rim to rim is about 475 feet and the height of the pit from floor to top of face at the centre is about 135 feet. In the more central part of the pit the section consists of: Shattered pieces of bed-rock, more or less cemented together; about 15 feet of gravels bearing evidence of strong water-action; about 6 feet of indurated silt; about 40 feet of silt and fine gravels; about 60 feet of blue boulder-clay; and finally on top of the clay the customary post-Glacial run about 10 feet in thickness. The boulder-clay breaks up very easily for this kind of

material and is readily disintegrated by the monitor. The section of unconsolidated materials overlying bed-rock is in many respects similar to that exposed in the hydraulic pit of Germansen Mines, Limited. A nugget weighing about 2½ oz. was recovered this year from the gravels on the east rim, but at the time of examination little or no further work had been done.

So far as can be determined from present exposures, the gravels overlying bed-rock are glacial, but it does not therefore necessarily follow that the channel was carved in Pleistocene times. It may have been cut in pre-Glacial times, and the gravels of that period subsequently disturbed by ice-movement and later resorted by glacial streams. The proportions of the channel, and the fact that it has been found to contain gold of the character mentioned, amply justify its further close investigation. Added to this, its position high above the river affords excellent dump facilities for hydraulicking. It is evident, however, that very little headway can be made with the present inadequate water-supply from Plug Hat Creek, unless this can be improved. Mill Creek is much larger, but is utilized in part at the present time, and it is not known just what amount of water could be obtained from this source. Assuming that investigation should afford justification for the expense involved, a large water-supply could be obtained from the Germansen River. There appears to be no near topographic indication of the exact up-stream course of this channel, which must remain largely a matter of conjecture pending further investigation.

It is understood that subsequent to examination this year further leases were staked, and also that the property was acquired by C. F. de Ganahl.

(NOTE.—All elevations given in the report on the Germansen River, and in reports of individual properties thereon, are aneroid determinations.)

LOST CREEK AREA, MANSON RIVER.

One week was occupied in an examination of the Manson River in the vicinity of Lost Creek, and the region adjacent to the latter.

The region may be readily reached by the road now in course of construction from Fort St. James to the Manson section. The local wagon-road system of this section extends to the mouth of Lost Creek. Further particulars of the means of access will be found under "Germansen River" in an earlier part of this report. Alternatively, the region may be reached from Fort St. James by aeroplane, landing being effected on either Lower Wolverine Lake or Upper Manson Lake. The latter is preferred by aviators.

In the vicinity of Lost and Skeleton Creeks the Manson River flows almost due east and rock benches flank both its banks. The one on its right bank is quite extensive and some hundreds of feet in width near Lost Creek, and the height above the river varies up to 50 feet. This definite rock-bench area ends about opposite Dry Gulch, and down-stream from this point the rock-rim of the river-valley rises at the back of extensive bars almost vertically to a height of about 30 feet, and then flattens suddenly to ground sloping gently upwards, but underlain by rock at shallow depth. This slope merges farther down-stream in extensive gravel flats.

Conspicuous features are the two large valleys, McCorke¹ and Big Wolverine, which extend through to the Manson River Valley respectively from the Germansen and Omineca River Valleys. These cross-valleys are closely parallel, about 2 miles apart, and are separated by the mountain known as Bert's Peak. The former is about 60 feet above the Manson River, but the surface of Wolverine Lake, situated at the south-east end of the latter, is about 30 feet below the Manson River at the mouth of Dry Gulch. These valleys and their possible significance are discussed under "Germansen River" in this report.

An extensive, wide depression in Skeleton Mountain, at an elevation of 335 feet above and on the south side of the Manson River, trends more or less parallel to it. Lost Creek, flowing northerly, emerges from a rocky gorge in the higher mountain-slopes, crosses this depression, and enters a narrow deep rocky gorge on the north side of it. The creek is confined in the latter gorge, which trends north-easterly, until it ends abruptly at the back of the extensive rock bench, previously mentioned as flanking the right bank of the Manson River in this region. Flanking the top of this last-mentioned gorge, on the east side, hummocky morainal ground slopes gradually from the level of the large depression in Skeleton Mountain to the bench paralleling the Manson River. The morainal ground, occupied by a small lake in its northern part, passes diagonally across the lower part of the valley of Skeleton Creek,

which above this point is largely unfilled. This moraine is considered pertinent to placer occurrence and its seeming significance will be discussed later. On the west side of the gorge broken morainal ground extends to the flanks of the adjacent mountain, known locally as Lost Creek Mountain. A depression trending parallel to the gorge was possibly formed by post-Glacial streams.

The region is in main well timbered, save that rock benches have been partly cleared by miners, and the lower slopes of Skeleton Mountain have been burnt over by bush fires.

The rock formation is well exposed on the Manson River and in Lost Creek Gorges, and is practically the same as that cut by the Germansen River below Horseshoe Creek (an account of which will be found under "Germansen River" in this report). There is the same repetition of alternating bands of schistose sediments and metamorphosed rocks considered to be chiefly volcanics. The latter evince the same frequent development of quartz veins; some mineralized with pyrite and galena, but similar quartz veins, mineralized with freibergite, have not been seen in this area by the writer, although they may exist. On the south-western slopes of Bert's Peak are frequent outcrops of gneissic quartz diorite, which also outcrops at several points between the head of Elmore Gulch and Lost Creek on the south side of the Manson River. Serpentine containing asbestos is exposed at the head of Elmore Gulch. It is evident that the formations eroded in the region under description are not unfavourable as a source of material for the formation of bed-rock placer deposits in Tertiary times.

Early mining operations in this region were concerned mainly with the quite extensive deposits on Lost Creek, and on the rock benches flanking the Manson River. Judging from their extent, the former appear to have proved very profitable and the latter also productive. Later operations include the hydraulic operations of G. W. Otterson on the left bank of the Manson River; those of McKinnon on the upper part of Lost Creek above the large depression previously mentioned in Skeleton Mountain; and the driving of certain adits in the right bank of the lower part of Lost Creek by W. B. Steele and J. Mullan. More recent still was the installation of a drag-line on the Manson River at the mouth of Dry Gulch, its short-lived operation in 1931, and the drag-line operations of Omineca Placers, Limited, at the south-east end of McCorkell Valley. Present operations engage the activities of two companies and several individuals, with the result that attention has been again limited to the potentialities here apparent. ("Placer-mining in British Columbia," Bulletin No. 1, 1931; Annual Reports of the Minister of Mines for 1933 and 1935; Geological Survey of Canada, Summary Report, 1933, Part A.)

Recent examination suggests that two clear-cut major mining possibilities yet remain: (a) The bed of the Manson River in this region and (b) the buried pre-Glacial channel of Lost Creek. In addition to these are the unworked parts of rock benches on the Manson River and deposits overlying the gently-sloping rock-rim on the south side of its valley. The coarseness of the gold recently found in the two last-mentioned deposits also invites and justifies further investigation, although their importance cannot be quite as clearly perceived.

The rock bench on the right bank of the Manson River in the vicinity of Lost and Skeleton Creeks is, near the river, overlain with shallow post-Glacial gravels, which were largely worked by the early miners. Instream, however, it is evident that the post-Glacial waters did not cut down to the rock as the superficial post-Glacial deposits rest on glacial material overlying bed-rock. Recent investigation apparently shows, however, that values in coarse gold also occur in the lowest stratum of the glacial deposits.

The rock benches clearly represent former channels of the river, and as it has been demonstrated that these benches were overlain with auriferous material, it is a logical inference that gold will be found in the bed of the river at the intersections with its former channel. It is unlikely that the depth to bed-rock in the present river is great at any point in the part under discussion, but the commercial aspects are dependent upon the extent of the values, which can only be accurately determined by Keystone-drilling. It is understood, however, that systematic drilling was carried out in the bed of the river prior to examination this year by Yukon Border Placer Golds, Limited, between Dry Gulch and somewhat above Slate Creek. The results are not known to the writer, but it is understood that a company, Northern Placers, Limited, has recently been incorporated for the operation of this ground.

The exact significance of the extensive depression in Skeleton Mountain occupied by Mosquito and other smaller lakes is not quite clear. It was suggested in the Annual Report

for 1933 that it might represent a Tertiary channel of the Manson River. Be that as it may, the other topographic features surrounding Lost Creek, coupled with available information as to adits formerly and recently driven in the right bank, strongly indicate that a pre-Glacial channel of this creek lies buried in its right bank. The moraine of the glacier which at one time occupied this channel can be perceived immediately east of the gorge the creek now occupies, trending almost parallel to the latter, but extending across the valley of Skeleton Creek, which is largely devoid of glacial debris in its lower part. The descent of the glacier occupying the pre-Glacial channel of Lost Creek apparently dammed the waters of Skeleton Creek, a morainal lake being formed temporarily. The former position of this lake is now indicated by swampy ground, the drainage of which is sealed by the moraine of the glacier mentioned. Skeleton Creek, its original outlet being blocked, succeeded in cutting completely through the moraine at a point west of its former channel, and followed this course until it was rediverted into its original channel by the placer-miner. The post-Glacial rejuvenation of Lost Creek resulted in the creek incising a deep gorge almost paralleling and immediately west of its former channel, but at one or two points it cut into the left rim, giving rise to the post-Glacial deposits in the gorge, which were almost completely worked by early miners. The latter apparently perceived the fact that the source of the interrupted run of gold was lateral, if they did not grasp the full significance of the surrounding topographic features, and various adits were run in the right bank of the creek in search of the lost channel. Hence, doubtless, the apt name originally given to this creek. As determined by pacing, the length of the gorge is 5,800 feet; it ends abruptly at the instream edge of the extensive rock bench paralleling the Manson River, about 1,500 feet from the mouth of the creek. Adits were driven at points 1,075 feet, 1,925 feet, and 4,045 feet respectively distant from the mouth of the gorge. Another adit, at 4,495 feet from the point mentioned, was driven by R. Dunsmore this year. Information is available only concerning the two last mentioned. That at 4,045 feet from the mouth of the gorge was driven by W. B. Steele and J. Mullan somewhat over twenty years ago. Practically all the information available concerning it was kindly supplied by W. B. Steele. He states that it was driven a distance of 550 feet before encountering bed-rock. At this point pay-gravels were struck and a vertical raise (118 feet in length) was put through to the surface for ventilation. The adit was then advanced a further distance of 200 feet. Where pay-gravels were encountered the ground was drifted over a width of about 40 feet, and gold to the value of several thousand dollars is stated to have been recovered.

The collar of the air-shaft is situated about 200 feet east of the gorge and about 80 feet above Lost Creek. The upper part of the air-shaft is still intact, but the workings are caved and inaccessible. This year R. Dunsmore drove an adit 30 feet long from the creek-level in the gorge into the right bank of the latter at a point about 200 feet north-west of the air-shaft. This adit was started in rock but ran into gravels. Accordingly, a shaft was sunk in the gorge a few feet up-stream to a depth of 25 feet, and it is stated that a drive from this shaft, 22 feet below the collar, in a distance of 10 feet broke into pay-gravels. This working could not be fully examined as it was bulkheaded.

As determined by aneroid, the fall from the head to the mouth of this gorge is 290 feet; the length is, as has been mentioned, 5,800 feet; that is, the fall is 5 per cent. Available facts indicate that the bed-rock of the pre-Glacial channel is about 25 feet below the gorge. It seems entirely reasonable to suppose that the gorge has cut sufficiently low to reach the auriferous gravels in the pre-Glacial channel as far as the lowest adit (below which there was no "pay" in the gorge), 1,075 feet above the mouth. Therefore, presumably, the bed-rock gradient will be much the same as that of the gorge, and the outlet of the channel should be found, east of Lost Creek Gorge, by Keystone-drilling, for example, at an elevation of about 25 feet above the river, at the back of the rock bench instream from the latter.

The upper part of Lost Creek above the large depression in Skeleton Mountain is also largely confined in a rocky bed for a considerable distance. The McKinnon hydraulic operations were carried on at one place where the right rim of the post-Glacial channel has been entirely eroded, and where the pre-Glacial channel lies buried in the right bank of the creek. Owing to extensive sloughing of the pit it was not possible to discern whether bed-rock of the pre-Glacial channel had been reached, nor is it known what amount of gold was recovered as a result of these operations.

Considering this creek as a whole, irrespective of the fact that the ground is not vested in one ownership, available information inclines the view that it may constitute a hydraulic enterprise of some magnitude. The depth to bed-rock does not seem likely to prove excessive, and from the upper part of the Manson River doubtless an adequate water-supply could be secured. An all-important matter from the point of view of hydraulicking is that of dump facilities; that is, the height of the lower end of the buried channel above the river. This can best be determined by Keystone-drilling, although it is presumed to be considerably above the present bed of the river. Once this point is established a few cross-sections at higher points would afford the necessary additional preliminary information prior to hydraulic installation.

There is much to suggest that the values on bed-rock in this buried channel may prove sufficient to enable the channel to be profitably mined by deep-lead methods. Inasmuch as the ground covered is not vested in a common ownership, quite possibly this method will be followed in part at any rate.

This is a private company, incorporated in 1936, with registered office at **Lost Creek** 826 Vancouver Block, Vancouver. The president is Bert McDonald. The **Placer Gold, Ltd.** property consists of placer-mining leases numbered 736, 737, 738, 739, 740, 741, and 818. Of these, five leases adjoin and cover the ground on the right bank of the Manson River for a distance of about 1½ miles, in the vicinity of Lost Creek, and also about the lower half-mile of the latter, including part of the probable position of its pre-Glacial buried channel. Two leases, Nos. 739 and 740, are situated on the north side of the Manson River and cover part of the extensive floor of Big Wolverine Valley adjacent to the river.

The means of access and the topography of that part of this property on the south side of the Manson River are described in detail in the general account of this area previously given.

The leases on the north side of the river cover Dry Gulch, a deep narrow cleft in the southeastern extremity of Bert's Peak. The head of this gulch is level with the floor of Big Wolverine Valley. The latter, as determined by aneroid, is about 25 feet above the Manson River at the mouth of the gulch. The floor of the valley slopes downward towards Wolverine Lake, and the latter is considerably below the river-level at the mouth of the gulch. In spite of this fact, the lake is drained by Wolverine Creek into the Manson River, because the latter, about 1½ miles down-stream, falls below the level of the lake. Near Manson River the floor of Big Wolverine Valley is well timbered, but near the lake it is occupied by meadows.

The formation exposed on this property has been previously described. Three separate types of placer occurrence are exemplified:—

- (1.) The lower part of the buried pre-Glacial channel of Lost Creek.
- (2.) The unworked parts of the extensive rock bench flanking the right bank of the Manson River.
- (3.) Post-Glacial concentration on the floor of Big Wolverine Valley.

The potentialities of (1) above have been discussed in an earlier section of this report.

The post-Glacial deposits on the rock bench flanking the right bank of the Manson River—(2) above—were extensively worked by earlier miners. The latter evidently discovered that at the instream part of the bench pay-gravels were underlain by glacial material and not by rock, as was the case nearer the river, and did not apparently work below the superficial pay-gravels. After preliminary investigation by Bert McDonald, the company installed a caterpillar steam-shovel with bucket of ¾-cubic-yard capacity at the instream part of this rock bench, on the right bank of Lost Creek. The power-shovel, together with a caterpillar tractor and portable grizzly and sluice, constitutes a mobile digging and washing unit, which serves well the purpose for which it is intended. Water for sluicing is conveyed from Lost Creek by flume and pipe-line. At the time of examination, at the point mentioned, the face of the pit, 20 feet in height, exposed a thickness of from 3 to 8 feet of post-Glacial gravels overlying a thickness of 12 to 17 feet of mixed boulder-clay and glacial materials, resting on bed-rock. It was apparent that quite coarse gold was being recovered at this point, and that values exist not only in the post-Glacial gravels, but in the underlying glacial material.

At relatively small cost, the equipment described will be employed to test the remaining unworked parts of this rock bench. In the course of doing so it is possible that some useful information may be gained as to the exact position of the pre-Glacial channel of Lost Creek.

It is only by detailed testing that the potentialities of the floor of Big Wolverine Valley—(3) above—can be accurately determined. It is known that on the left bank of the Manson River below Dry Gulch an encouraging concentration occurs at various depths below the surface, on successive layers of indurated glacial material. There have been evidently active post-Glacial streams flowing throughout Big Wolverine Valley, and concentration due to resorting may be found at points away from the Manson River. This valley was probably subjected to "big valley" glaciation due to a south-eastward movement of the ice from the high mountains on the north side of the Omineca River opposite the north-west end of the valley. The bed-rock, the depth of which is not known, has therefore probably been scoured by ice. Dry Gulch was evidently rapidly incised. Cutting was possibly commenced in inter-Glacial times and subsequently completed. Up-stream from Lost Creek, about opposite the old *Bumble Bee* placer claim, an embayment in the left bank of the Manson River, coupled with an apparent gap in the rock-rim at this point, suggests that a channel-segment of the river possibly lies buried instream between this point and another in Big Wolverine Valley north of the head of Dry Gulch. Time was not available for close investigation of this point, which seems important.

Leases of R. Dunsmore and Associates. It is understood that this property comprises three placer-mining leases and one placer claim on Lost Creek. The property immediately adjoins up-stream that of Lost Creek Placer Gold, Limited, and covers part of the probable position of the buried pre-Glacial channel of this creek. The address of the owners is Prince George. The means of access, topography, type of deposit, apparent potentialities, and underground workings are described in detail in the general account of this area previously given. At the time of examination, operations had been temporarily suspended pending installation of a pump to render possible further investigation at the point at which discovery of pay-gravels was reported. Investigation may also disclose some remaining portions of post-Glacial deposits that escaped the attention of early miners in the gorge.

Leases of S. Rosetti and A. E. Hayward. Two placer-mining leases numbered 575 and 652, situated on the right bank of the Manson River down-stream from Skeleton Creek, adjoining the property of Lost Creek Placer Gold, Limited, are held by S. Rosetti and A. E. Hayward, of Fort St. James. The property is reached by foot-trail from the camp of the company named. The property is situated at the bend of the river where the direction of flow changes from due east to south-east. Instream from bars which flank the river at the bend, the rock-rim of the valley rises sharply to a height of about 30 feet above the river and then flattens to a gently-sloping rim, which merges down-stream in an extensive gravel flat. The ground is timbered.

Investigation has shown that this gently-sloping rim is underlain, at a depth of a few feet, by rock sloping roughly parallel to the surface in its lower extremity, but exhibiting a tendency to dip inwards at points more distant from the river, creating the idea of the existence of a possible channel trending more or less parallel to the river.

The mode of placer occurrence exemplified is that of concentrations immediately overlying rock, both in post-Glacial gravels and in gravels overlain by unsorted glacial material. The character of the gold is generally quite coarse, and a nugget of about 2½ oz. in weight was recovered this year.

Utilizing water from Skeleton Creek conveyed by ditch-line, by ground-sluicing and hand-mining, three pits have been opened up from the top of the sharply-rising rock-rim. These cover a river-frontage of about 700 feet and extend back from the edge of the rock-rim to a maximum distance of about 225 feet. The general direction of these pits is southerly.

It is understood that the ground was drilled this year by Yukon Border Placer Golds, Limited, but values encountered are not known to the writer. The large nugget was, it is understood, discovered subsequently.

While a definite channel has not been revealed, it has been demonstrated that coarse gold underlies glacial material, and further investigation is warranted. This can be accomplished by continuing instream the lower pits, which is the present intention of the owners.

(NOTE.—All elevations given in the report on Lost Creek Area, Manson River, and also in reports on individual properties therein, are aneroid determinations and are therefore approximate.)

COTTONWOOD RIVER.

Placer occurrences along the Cottonwood River between the Quesnel-Barkerville and Prince George-Quesnel Road crossings, a distance of about 26 miles, were studied during the 1936 field season. The object of the field-work was not to examine every placer deposit along this part of the river, but to obtain sufficient information to afford a clear insight into the various types of placer occurrence and their mode of origin.

A traverse of the river from the bridge near Cottonwood to Mile 22 was made by the Department of Lands in 1923. At that time mile-posts giving distances from the bridge near Cottonwood down-stream were placed in position. The locations of these posts are shown on the accompanying map and they are used as reference points in this report.

The area immediately adjacent to the river is inaccessible by road or trail for any great distance, due to the very steep banks which flank the river and also to the numerous rock canyons through which it flows. A road passable for motor-trucks leaves the Prince George-Quesnel Highway at Cinema and extends for a distance of about 6½ miles to the plateau on the north side of the river. A horse-trail, known as "Coughlin's Trail," continues from the road following the plateau at some distance from the river to Pre-emption Lot 9670, where it descends to the river, and thence follows in places the river and in places the plateau to the road crossing near Cottonwood. The trail is in disrepair from Mile 9 to Mile 4. Access to the lower part of the river is by a foot-trail from "Cottonwood Hill" on the Prince George-Quesnel Highway. This trail crosses a sparsely-timbered flat adjacent to the highway, and then descends steeply to the left bank of the river, which it follows closely, terminating at the eastern boundary of Pre-emption Lot 8594. The central part of the river is conveniently reached by a branch road which leaves the Quesnel-Barkerville Road 7½ miles from Quesnel and, crossing the plateau in a north-easterly direction, ends at the rim of the river-valley. From this point a steep horse-trail leads to a ford across the river at the western boundary of Pre-emption Lot 9670. Trails to individual properties are described in the following reports on them.

The Cottonwood River has incised a valley to a depth of from 300 to 350 feet in the rolling, timbered Fraser Plateau. Between the Cottonwood Bridge and Pre-emption Lot 9670, the river meanders in a wide mature valley, with the single exception that it is contained in a rock canyon about 1 mile in length near the 10-Mile post. With this exception, rock-exposures near the river are not numerous in this part of the valley. Immediately down-stream from Pre-emption Lot 9670, the river makes a sharp bend to the north, its valley narrows, and it enters the first of a succession of steep-walled rock canyons. The last canyon is practically continuous for a length of nearly 4 miles extending from above the 20-Mile post to about a quarter of a mile above the north-east corner-post of Pre-emption Lot 8593. From the last-mentioned point to the western boundary of Pre-emption Lot 8594 the river has cut through a mass of glacial debris hundreds of feet in thickness, forming a remarkable hairpin bend, described in the body of this report. At the western boundary of Pre-emption Lot 8594 the river again enters a short rock canyon, about 400 yards in length, terminating at the bridge on the Prince George-Quesnel Highway.

Many of the canyons cannot be traversed throughout at any stage of the water owing to the precipitous nature of the walls, but ample rock-exposures were examined to show that the formations cut by the river consist of alternating bands of volcanic and sedimentary rocks. The bands are usually several hundred feet in width. The sediments are chiefly thin-bedded argillites. They are considerably folded, strike mainly north-westerly with south-westerly dip, but both strike and dip vary. The volcanics are andesitic and contacts are very poorly defined. The aforementioned rocks are intruded at a number of places by batholithic tongues, and by stocks of considerable size at 10-Mile and 17-Mile Canyons. At the two latter points the batholithic rocks exemplify magmatic differentiation. Coarse-grained diorite, pegmatitic in places, exposed at the lower end of 10-Mile Canyon, passes into pyroxenite farther up the canyon. Porphyritic pyroxenite with phenocrysts of augite is exposed at 17-Mile Canyon. Pegmatitic diorite is also exposed on the left bank of the river at the 11-Mile post, and also on the right bank of the river a quarter of a mile up-stream from the 12-Mile post. Although the intruded rocks show considerable pyritization at different points, there is little evidence of the existence of quartz veins in the formation exposed by the river. A large vein of calcite is exposed in 10-Mile Canyon, and also a small seam of brecciated calcite mineralized with

pyrite. It is, however, evident that the presence of ultrabasic rocks affords a logical explanation for the occurrence of metals of the platinum group, and the large amount of black sand and unusually coarse magnetite and hematite in placer gravels.

In considering placer occurrence, four chief features are evident:—

(1.) The indications are that that part of the valley where no rock is exposed, and almost exactly delimited as lying within Pre-emption Lots 8593 and 8594, is crossed at right angles by an ancient valley formerly occupied by a northward-flowing stream. It is believed that this ancient valley is quite possibly the down-stream continuation of the buried Tertiary Horsefly River Valley. (Refer to Annual Report for 1935, page C 27.) However interesting this supposition may be when considered in conjunction with the fact that the direction of flow of the Quesnel, Willow, and Bowron Rivers is in accord with a northerly- and not a southerly-flowing master-stream, its further discussion is not germane to this report, save that the pre-Glacial channel of the Cottonwood River mentioned later was probably a tributary of the ancient master-channel.

(2.) Topographic evidence indicates that a lengthy pre-Glacial channel-segment of the Cottonwood River lies buried immediately instream in the right bank, in the northward-flowing part between Pre-emption Lot 9670 and the point at which the river makes a sharp turn, thereafter flowing westerly, at the 20½-Mile point. An exposure about 500 feet long of what are believed to be pre-Glacial gravels was found on the right bank of the river about a quarter of a mile up-stream from the 19-Mile post. The creek, shown on the accompanying map, cuts down through the overlying glacial gravels and into these gravels. Bed-rock is not exposed.

In the absence of fossil evidence, the following criteria are considered as indicative of the pre-Glacial age of *river-gravels*: (a.) The *residual* character, whereby they should contain a large proportion of pebbles composed of a resistant mineral. (b.) Prolonged Tertiary erosion must have been accomplished at the loss of gradient, and therefore preserved Tertiary river-gravels are likely to be of uniform and medium size. (c.) The gravels are partly or wholly cemented, but this fact *per se* is by no means indicative of pre-Glacial age. (d.) The gravels underlie glacial gravels, which fact, considered in conjunction with the other features mentioned, is indicative of pre-Glacial age. The gravels in the aforementioned exposure are chiefly composed of medium-sized quartz pebbles, partly cemented and overlain by glacial gravels, and, therefore, according to the criteria given, are believed to be pre-Glacial.

(3.) The part of the river confined almost entirely in a long rock canyon between the 20½-Mile point and the eastern boundaries of Pre-emption Lots 8593 and 8594 is considered as being largely post-Glacial in age, although cutting may have commenced in inter-Glacial times. Placer occurrences in this part consist essentially of deposits occurring on rock benches at various elevations above the river, representing successive channels occupied by the river in cutting down to its present bed. The down-stream continuation of the pre-Glacial channel, mentioned in (2) as lying buried instream in the right bank of this part of the river, is a matter of conjecture. It is possible that the present river has followed an entirely different course from that of its pre-Glacial channel down-stream from the 20½-Mile point. On the other hand, further investigation may disclose the existence of the pre-Glacial channel in that part of the valley under consideration.

(4.) It is evident that the river flows over indurated glacial deposits at many points in that part of the valley up-stream from Pre-emption Lot 9670. These gravels are considered to be inter-Glacial from the fact that they contain seams of well-carbonized lignite where exposed on the left bank of the river somewhat above the mouth of Boyd Creek. Pre-Glacial channel-segments are indicated as lying buried instream in the left bank of 10-Mile Canyon and in the right bank in the vicinity of the 12-Mile and 13-Mile posts. The depth at which bed-rock lies is quite unknown.

The placer deposits along the Cottonwood River were worked by the early miners, and still engage the activities of a number of individuals and one company. Extensive old workings are situated on the right bank of the river up-stream from Deep Creek, at the head of 10-Mile Canyon, and at the lower end of this canyon. The last mentioned are the most extensive and cover an area of many acres. Less extensive old workings occur at other places along the river.

The placer deposits worked to date are of several different types:—

(1.) River-bars occur throughout in the part of the river examined. In some cases comparatively coarse gold is found on bars, probably due to a local source.

(2.) Bench deposits of gravel which are of quite widespread distribution and which were worked extensively by the early miners. A noteworthy example of this type of deposit occurs at the hairpin bend of the river on Pre-emption Lot 8594, where profitable deposits were found on each of a succession of terraces on the steep-sided peninsula. In each case the "pay" extends down to a layer of indurated glacial gravel.

(3.) Bench deposits of unusual type are exemplified on the lease held by F. Norn on Pre-emption Lot 8594, and also on the lease held by J. D. Pearson and D. E. Ruttan. The deeply-embayed remnants of the once-existent peninsula on the lease of the former, and the position of the sloughs on the inner edges of both leases, indicate that the benches originate from the formation of a hairpin bend, followed by the gradual washing-away of the steep-sided "peninsula" of indurated glacial gravels. In addition to the usual superficial concentration of gold, it is evident that in these particular cases there may exist a concentration along the original course of the river on the benches on a false bed-rock of indurated glacial material. Whether the concentration is commercial can only be ascertained by testing.

(4.) In the case of some benches it is evident that post-Glacial waters have cut down to the older indurated glacial gravels, carving more or less definite channels therein. In such cases the gravels may prove auriferous down to the false bed-rock, and the advisability of adequate testing with that idea in mind is indicated.

(5.) Deposits on rock benches. Deposits of this type occur at various elevations above and on both sides of the river at numerous places, but are most prevalent contiguous to the long canyon, which commences at about the 19½-Mile point. Rock benches indicate former channels occupied by the river in cutting down to its present position, and there may or may not be commercial concentration down to the bed-rock from the surface. Where from the topography it appears likely that the river has crossed a former channel there may be a good concentration in the bed of the stream immediately below the point of crossing. This is possibly the case at the 23½-Mile point, where there is a narrow channel on the north side and a wider one on the south side of a small island in the river. The bed-rock of the narrow channel was cleaned by wing-damming, but an attempt to work the wider channel was unfortunately frustrated by the wing-dam being carried out.

Most of the deposits contain appreciable amounts of platinum, and in one case iridium was found. In some instances a large amount of coarse magnetite and hematite is present. When such is the case good values in gold are almost invariably found. A logical explanation of the source of both metals of the platinum group and the iron minerals is afforded by the ultrabasic batholithic rocks traversed by the river. As previously mentioned, these rocks exhibit pronounced magmatic differentiation. The gold occurs chiefly in fine to coarse flakes, but at some places small nuggets have been found.

It is noteworthy that bench deposits, whether on false or true bed-rock, are in the majority of cases overlain by a practically barren deposit of sand up to several feet in thickness. The depth of this overburden in many cases is the determining factor of the commercial possibilities.

The gold present in the types of deposits so far noted originates either from glacial materials or from the reworking of glacial or older materials where the present river has intersected older channels. The irregular distribution of placer-gold deposits so formed should be borne in mind, and the advisability of adequate testing by pitting or drilling is clearly indicated before expenditure of material capital outlay. For example, in a succession of gravel terraces one may be very good, but for no apparent reason another immediately above or below may be unprofitable. On the other hand, as, for example, at the hairpin bend on Pre-emption Lot 8594, each terrace in a succession may prove profitable.

No attempt has been made to mine the pre-Glacial gravels exposed at the places mentioned. Therefore the depth to bed-rock and possible values present thereon are unknown factors. The possible occurrence of bed-rock values is at present a matter of pure inference and can be gauged only by a knowledge of the formations eroded. The formations eroded consisted largely of sedimentary and volcanic rocks, and the presence of a large amount of quartz pebbles in the pre-Glacial gravels suggests that quartz veins occurred in the eroded formations. There is no proof that such veins, if they existed, were auriferous except for the presence of gold

in the younger gravels. The presence of ultrabasic rocks, however, does suggest that bed-rock gravels may prove platiniferous. The tight and partly-cemented character of the pre-Glacial gravels exposed is a feature favourable to mining. Only "deep-lead" methods could be applied, so far as is now known, and therefore values would have to be correspondingly good to render extraction profitable. It is also to be borne in mind that rivers, as distinct from creeks, were not the agencies whereby bed-rock deposits of bonanza type were formed.

The position of this lease, held by J. D. Pearson, of Quesnel, is shown on the accompanying map. The part on the south side of the river is reached by the trail from "Cottonwood Hill" on the Prince George-Quesnel Highway described at the commencement of this report. The part north of the river is reached by a steep foot-trail which leads from the highway-bridge to the top of the canyon-wall, and after following this for a short distance descends to the river. Comparatively low-lying terraced gravel benches extend down-stream for about 600 feet from the eastern boundary of the lease on the north side of the river. The benches are crescent-shaped, covered with heavy timber, and have a maximum width of about 375 feet. It is possible that a concentration may occur on them, but they have not been investigated in any detail.

Immediately below the highway on the south side of the river, and 200 feet above it, is a flat, sparsely timbered area several acres in extent. It is covered partly by this lease, but fully by another under application, staked by associates of the owner. While a concentration on this flat is possible, it has not been tested apparently to any extent, and its elevation above the river renders wash-water a problem. About 35 feet above the river is a timbered flat approximately 600 feet long by 150 feet wide underlain by rock, on which some testing has been done by pumping water from the river. The writer does not know what values were found.

The lease also covers a part of a large deeply-embayed flat, in part meadow, in part covered with willow and poplar growth, situated about 15 feet above the river. The remaining part of this flat is covered by D. E. Ruttan's lease. This unusual type of bench is illustrated on the accompanying map and its indicated mode of origin and potentialities are given in the preceding text of this report. This flat contains ground of potential promise, and more detailed systematic testing seems warranted to ascertain average values in place.

This placer claim, owned by C. Mackenzie and associates, is situated at the entrance to the canyon above the highway-bridge, within the area covered by the J. D. Pearson lease. It is reached by a branch trail from "Cottonwood Hill" on the Prince George-Quesnel Highway. It is reported that many years ago, at a time of exceptionally low water, coarse gold was found in the bed of the river near the right bank immediately opposite a small rock promontory on the left bank, around which the river bends. To divert the river at low water and obtain access to bed-rock in the spot mentioned, the owners commenced a 110-foot tunnel through the promontory. After driving the tunnel 70 feet, high water occurred, the portal was blocked with sand and gravel, and the project temporarily abandoned.

This lease is held by D. E. Ruttan, of Quesnel, and is reached by the same trail as the J. D. Pearson lease. The ground covered comprises part of the deeply-embayed flat 15 feet above the river, described in the lease of J. D. Pearson. The owner has done a certain amount of washing of superficial gravels at a point some hundreds of feet instream in the central part of the flat, and states that encouraging values were obtained.

This lease adjoins the Ruttan lease up-stream and is reached by the same trail. The ground comprises a number of timbered gravel benches which flank the left bank of the river to a maximum height of 175 feet. Other gravel benches flank the eastern side of the deeply-embayed low-lying bench covered by the Pearson and Ruttan leases. This lease so far as is known has not been tested in any detail.

This lease is held by F. Kruczek and associates, of Quesnel, and is reached by the trail previously described as leaving the Prince George-Quesnel Highway at "Cottonwood Hill." The river is crossed by boat to the workings. The ground comprises mainly the long, narrow, steep-sided promontory, or "peninsula," within the hairpin bend of the river at this point. The promontory is com-

posed largely of indurated glacial gravels, which rise vertically from the river on the east side and in benches on the west side to form a sharp ridge at the top. This promontory is noteworthy for the number of successively profitable benches which have been found to occur one above the other, from a few feet above water-level to an approximate height of 100 feet, and possibly above this elevation. These benches occur on the south end of the promontory and extend for a considerable distance on the west side but not so far on the east side, which rises sheer from the river. Concentration is due to the resorting action of the post-Glacial waters on successive strata of indurated material serving as false bed-rocks. Flanking the west side of the promontory are three benches at successive elevations of about 10 feet, 35 feet, and 45 feet above the river. The lowest bench is practically continuous on the west side and extends around the south point of the promontory, where its length is about 500 feet and its maximum width is about 300 feet. The middle bench is about 360 feet long by 120 feet wide and the uppermost bench is about 575 feet long by 55 feet wide.

There are three benches on the point of the promontory, at elevations of 25 feet, 60 feet, and 100 feet above the river, respectively. The approximate dimensions are 320 by 45 feet, 260 by 125 feet, and 600 by 100 feet, respectively. Several benches have been worked. The lowest has been completely worked, and it is stated that values were very good. The gravels were very coarse and there was little of the customary barren sand overburden. In the case of the middle bench, the thickness of gravels overlying the false bed-rock was 4 to 6 feet and sand overburden varied from a few inches to 5 feet. Work has been started recently on the uppermost bench, where about 3½ feet of sand overlies about 6 feet of pay-gravels.

The lease also includes a long, narrow bench on the opposite bank of the river facing the west side of the promontory. This bench, situated at from 5 to 15 feet above the river, is crescent-shaped, several hundred feet in length, and has a maximum width of about 225 feet.

Save for testing, the owner and his associates have confined their efforts mainly, but not entirely, to the promontory benches, in the working of which much initiative and energy has been displayed. Wash-water is pumped from the river by a centrifugal pump operated by a 3½-horse-power gasoline-engine. The gravels are mined by hand and the values recovered on an inclined blanket-table covered with expanded metal screen. Two pans taken of gravels only, from the top bench, indicated values of \$2.20 and \$2.62 per cubic yard respectively (gold valued at \$35 per ounce). One sample contained a trace of platinum. Another pan taken from the lowest bench on the east side of the promontory indicated values of 52 cents per cubic yard. It is stated that a shaft sunk instream in this region yielded encouraging values. It is to be borne in mind that these samples do not represent the average value of the ground in place, and no account of the overburden is taken into consideration.

This lease, held by F. B. Dowling, is situated on the left bank of the river, adjoining up-stream the lease of F. Kruczek, and is reached by the same trail.

Lease of F. B. Dowling. The ground comprises a low-lying, crescent-shaped, terraced area, fronting the sharp bend of the river and rising to a maximum height of 25 feet above it. The length is about 1,350 feet and the maximum width is about 700 feet. Behind this terrace rise higher benches of considerable extent up to the plateau-level. Work has hitherto been confined to the low-lying area. A pump-hydraulic pit was opened up at the up-stream end, where there are favourable dump facilities. About 400 cubic yards were sluiced at this point, from which it is stated that gold to the value of \$400 was recovered. Other testing carried out on this area indicates that there are more or less definite channels cut by post-Glacial waters in the underlying indurated glacial gravels.

H. McN. Fraser obtained options during the year on the leases of F. Kruczek, F. B. Dowling, and J. W. Allison, staked additional leases on the north side of the river, and carried out much systematic testing. It is apparent that the total yardage contained in the low-lying benches is very considerable, and the object of the tests was to ascertain if the area constituted a commercial project for a small dredge. Testing consisted in sinking a number of shafts at various points and washing the entire product, so that the value of the ground in place might be accurately determined. The shafts sunk were 6 by 3 feet in the clear and were tightly lagged from the collar down. It is not known to the writer what average values were obtained. At the time of examination fourteen of these shafts had been sunk to depths varying from 4½ to 13½ feet. The average depth of sand overburden encountered was about 2½ feet.

This lease is situated on the left bank of the river immediately below the **Lease of F. Norn.** mouth of the long rock canyon and lies partly within Pre-emption Lot 8594.

It is reached by the trail from the "Cottonwood Hill" on the Prince George-Quesnel Highway, previously mentioned; alternatively, a car with high clearance can be driven from Quesnel over the old Pacific Great Eastern Railway grade to within about 1½ miles of the property.

Rich superficial gravels were discovered on this ground by F. Norn in 1934 and he and his associates staked nine claims. In the same year C. W. Moore and his associates acquired an option on the claims, installed a pump operated by gasoline-engine, and carried out a certain amount of sluicing. For reasons unknown to the writer, operations were discontinued. The same ground was restaked this year as a lease by F. Norn. (Refer to Annual Report for 1935.)

The lease covers, for the most part, a deeply-embayed gravel bench, situated 25 feet above the river. The form of the bench is shown in the accompanying map. The area is mainly a large meadow devoid of timber, although the surrounding glacial banks on the south and west sides are well timbered. On the east side towards the river the ground rises in a series of benches to the plateau-level. On the east side, in the more immediate vicinity of the river, not far from the mouth of the large rock canyon mentioned, volcanic rocks either outcrop or have been uncovered at several places within an area about 450 by 150 feet. These rock-exposures are believed to be part of the right rim of a large buried channel which, surrounding features indicate, crosses the Cottonwood River at this point at right angles. Reference to this channel will be found in the opening paragraphs of this report.

It is strongly indicated that this bench, like that covered by the lease of J. D. Pearson and D. E. Ruttan, originated from a first-formed hairpin bend of the river.

On this bench two knolls of glacial gravels, one quite large, adjoining the river, and a smaller one farther instream, represent the remnants of the original promontory, around which the river once flowed. This view is further supported by the fact that the ground is swampy at the instream extremity of the bench, on the east and south sides.

At the time of examination the owner was mining by hand the upper gravels in the smaller glacial knoll, wash-water being supplied by means of a hand-pump from a pool in the swampy region. At this point shallow gravels overlie a false bed-rock of indurated glacial material. Two pan-samples taken by the writer merely corroborated the known fact that there are remarkably rich spots on this lease. It is stated that \$1,000 in gold was recovered from approximately 100 cubic yards at one place in 1934. The gold is quite fine, although individual pieces up to 25 cents in value are reported. It is not suggested that the values mentioned are by any means average values in place, but this ground clearly warrants systematic testing to determine *average values in place*.

This is a private company incorporated in 1936 for the purpose of acquiring and operating four leases on the river held by F. Peterson, H. Ahlbeck, **Cinema Gold Placers, Ltd.** A. Anderson, and G. Swanson. Three of the leases are situated on the north side and one on the south side of the river, but operations have so far been confined to G. Swanson's lease on the north side. The property is situated between the 21-Mile and 22-Mile points, and is reached by a road, passable for motor-vehicles, about 7 miles in length from Cinema, on the Prince George-Quesnel Highway. The road is in part the old Pacific Great Eastern Railway tote-road and is in part newly constructed. It leaves the highway just south of the bridge over Ahbau Creek, ascends to the timbered, rolling plateau, which is followed for some miles, and finally descends the steep glacial banks which flank the immediate approach to the river to the company's camp on a flat.

The ground held is situated in the long canyon section of the river which extends from the 19½-Mile point for a length of about 4 miles down-stream. At most places in the canyon the rock walls rise steeply to heights up to 150 feet or more. In some places the walls are capped with irregular masses of glacial debris which rise to the plateau-level. In other places the walls rise to timbered gravel-covered benches, at various elevations above the river, behind which steep glacial banks form the valley-rim. It is clear that these rock benches represent segments of earlier channels of the river formed in the process of cutting down to its present bed. Most of these benches are probably of post-Glacial age, although cutting of some may have commenced in inter-Glacial times, and the possibility exists that some form the left

rim of a pre-Glacial channel. The operations of the company at present are focused on G. Swanson's lease.

The discovery of gold on the part now under operation was made by G. Swanson and associates in 1935, and that year a certain amount of hand-mining was carried out, although operations were greatly hampered by the absence of a gravity water-supply, and the necessity of tramping gravels to the edge of the bench, dumping them into a chute, and washing them at the river-bed.

The company this year, after constructing the road to the property, proceeded to install a plant. At the time of examination in June, the plant had been hauled to the ground but had not been erected, and it is not known to the writer what has since transpired. It is understood, however, that a Fresno rotary scraper was to be used for mining and conveying gravels to a screening and washing plant, and that gold-recovery of the minus $\frac{1}{2}$ -inch material was to be effected in a Trail oscillatory concentrator.

The essential feature of the G. Swanson lease, on which the present attention of the company is concentrated, is a crescent-shaped flat about 600 feet long and 300 feet wide, sparsely timbered and underlain by rock, situated at a height of between 85 and 100 feet above the river. This flat is terminated at both ends and also instream by glacial banks, which rise steeply to a height of 350 feet above the river. The discovery was made at the down-stream end of the flat. Here the flat merges in somewhat broken ground sloping down to a rock bench at 40 feet above the river. The rock underlying the flat is a thinly-bedded ferruginous argillite, much oxidized and intruded in some places by small basic dykes.

Hand-mining operations carried out over a river-frontage of about 200 feet and a width of about 75 feet disclosed a gradually-rising ragged bed-rock immediately overlain by a thickness of about 5 feet of gravels, in turn overlain by a thickness of 5 feet of glacial debris. Good "pay" was found in the gravels, which are of medium size and composed of both local and foreign rocks. Much black sand is present and also small pebbles of magnetite and hematite. The gravels contain appreciable amounts of platinum and iridium. The character of the gold is mainly coarse flake-gold. A sample of black sand weighing 175 grams was assayed and contained values as follows: Gold, 16.88 cents; platinum, 89.16 cents; iridium, 2.7 cents (gold valued at \$35 per ounce, platinum at \$40 per ounce, and iridium at \$80 per ounce). It might be mentioned that in the case of placer deposits on this river the presence of *coarse* magnetite and hematite is almost always an indication of good gold values. The average of five pans, taken by the writer from the bed-rock gravels only, indicated values per cubic yard of \$8.36 in gold and 98 cents in platinum. Such values are not by any means representative of average values of the ground in place and take no account of barren overburden.

The up-stream part of the flat is overlain with gravels that are of post-Glacial age, whereas it will be noted that at the point of discovery the gravels are overlain by *unsorted glacial debris*. Unless the capping of the latter is due to creep of glacial debris from the somewhat closely adjacent banks, which is possible, the inference is that the underlying gravels are, at any rate, of inter-Glacial age. The possibility also exists that the down-stream continuation of the buried pre-Glacial channel-segment of the river, described in an earlier part of this report, lies deeply buried instream at this point. If such is the case the rock underlying this bench must be the left rim of that channel. The amount of investigation carried out to date is quite insufficient to express any definite opinion on this point or concerning the length and depth of the buried channel. It does not by any means follow that the limits of the flat, for example, indicate the length of the buried channel-segment. There is at present nothing incompatible with the suggestion that it might extend considerably beyond these limits, lying deeply buried under the masses of glacial debris which terminate the flat. Much must remain conjectural pending further investigation. Continuance of work at the point of original discovery in the hope of finding either bed-rock or slope of rim-rock would seem logical.

About 1,500 feet down-stream from the point of discovery, mainly on the lease of F. Peterson and extending partly on that of H. Ahlbeck, occurs another flat about 1,000 feet in length by 600 feet in width underlain by rock at 150 feet above the river. This flat is well timbered and apparently overlain by post-Glacial gravels in which some indication of gold values has been found.

It might be added that Hush Lake, a small morainal lake on the plateau 690 feet above the river, might constitute a useful water-supply for this property if investigation warranted its development.

Leases of H. Bellos and Associates. H. Bellos and associates, of Prince George, hold four leases adjoining up-stream the leases of Cinema Gold Placers, Limited, and a fifth situated immediately down-stream from the latter. Of the first four leases, two are located on the right bank of the river and two are on a small unnamed creek flowing into the river near the 21-Mile point. The property is reached by branch trails leading both up-stream and down-stream from the camp of Cinema Gold Placers, Limited.

On both sides of the creek mentioned are rock benches overlain by post-Glacial gravels on which a certain amount of testing has been carried out by utilizing water from the creek for wash-water. These benches lie at elevations of 50 and 70 feet respectively above the river on the west side of the creek and 55 feet above the river on the east side of the creek. Another flat of considerable extent flanks the creek instream from the rock benches mentioned, at a height of 100 feet above the river. Farther up-stream, to the limit of the leases, the valley-slope is steep and broken by gullies. The post-Glacial gravels on the rock bench, where exposed, are between 2 and 5 feet thick and are overlain by from 3 to 4 feet of sand. The average of two pan-samples, taken by the writer from gravels only, from rock benches on each side of the creek indicated values per cubic yard of \$2.83 in gold and 10 cents in platinum (gold valued at \$35 per ounce and platinum at \$40 per ounce). The samples do not represent the value of the ground in place. Instream the benches are terminated by steep valley-banks of glacial debris. It is possible that a channel lies buried instream from these rock benches, but there is no present indication of the depth to bed-rock.

The remaining lease is situated on the right bank of the river, where the valley is narrow and steep at about the 22-Mile point. The chief feature of interest is a timbered bench underlain by rock, overlain by post-Glacial gravels, and situated at a height of 150 feet above the river. The bench is about 800 feet long and 140 feet wide. A small amount of superficial gravels have been mined, but no systematic testing has yet been carried out.

Lease of Magnus Sundberg. This lease is situated on the right bank of the river up-stream from the 20-Mile point. It is reached by following a blazed course from a branch trail from Coughlin's trail to the river at about the 21-Mile point. Benches occur on this property of respective dimensions—475 by 50 feet, 800 by 105 feet, and 660 by 175 feet—at heights respectively of 15 feet, 45 feet, and 60 feet above the river. These benches are timbered and overlain by post-Glacial gravels. All are apparently underlain by rock. Very little investigation has been done, but pan-samples indicate promise.

Claim of R. J. Coughlin. Pre-emption Lot 9670 is owned by R. J. Coughlin, who also holds a placer claim on this ground. The property is reached by a branch road which leaves the Quesnel-Barkerville Road $7\frac{1}{2}$ miles from Quesnel and runs north-easterly across the plateau to the edge of the Cottonwood River Valley. From the end of the road a steep horse-trail leads to a ford at the western part of Pre-emption Lot 9670. The total distance from the main road is about $6\frac{1}{2}$ or 7 miles.

Pre-emption Lot 9670 is almost entirely a partly-cleared terraced flat lying at from 5 to 25 feet above the river. Behind this flat glacial banks rise sharply to a height of 250 feet above the river, which practically bounds the east, west, and south sides of the lot. Argillites are exposed on the right bank of the river. This fact, coupled with the surrounding topography, indicates that the pre-Glacial channel of the river lies buried instream in the right bank of the river in this region, but the depth to bed-rock is quite unknown. Good values are found on several river-bars, but the owner confines his attention, mainly, to one near the eastern boundary of Pre-emption Lot 9670. Believing that the deposit on this bar originated from high water cutting into the bench at a point just above the bar, the owner conceived the novel idea of making cuts in the bench so directed as to aid the cutting action of the river at high water. He states that the results have been very satisfactory, the gold deposited on the bar having shown a material increase.

The owner states that encouraging values have been found at several points on the large bench-area constituting the major portion of this pre-emption lot. Average values can, however, only be determined by systematic testing. The river in this region flows over indurated

glacial debris which is exposed at several points, and there might possibly be a concentration on this material. A pan taken by the writer from the bar being worked by the owner indicated values per cubic yard of 96 cents in gold and 6¼ cents in platinum (gold valued at \$35 per ounce and platinum at \$40 per ounce).

Lease of Alex. Madison. This lease is situated on the right bank of the Cottonwood River more immediately down-stream from the mouth of Frye Creek (or 16-Mile Creek as it is locally known). An adjoining lease on the east is under application by G. R. Baker and the exact boundaries are not known to the writer. The property may be reached either from Cinema by "Coughlin's trail," or alternatively from the Quesnel-Barkerville Road by the route above described to Pre-emption Lot 9670. From the latter a trail follows the right bank of the river to the lease.

The ground comprises a terraced gravel-bench area covered with vegetation and timber, the benches being situated at various elevations from a few feet to 90 feet above the river.

Placer occurrence exemplified in this region is that of post-Glacial deposits laid down on a false bed-rock, usually indurated glacial debris.

One bench 30 feet above the river was extensively worked by the very early miners, who brought water to the ground by a ditch-line from Frye Creek and flumed it across the river at the mouth of 10-Mile Canyon. An area covering many acres was mined, and these old workings, the date of which is unknown, are the most extensive of those observed on the river. The indicated reason for the rich concentration in this region is the fact that immediately below 10-Mile Canyon the river cuts directly across its pre-Glacial channel, which probably lies buried under this lease.

Much painstaking prospecting has been carried out by the holder of this lease in his search for ground in the region, which either escaped the notice of the early miners or was unprofitable at that time. He discovered one such region on a bench 5 feet above the river at the bend opposite the mouth of Frye Creek. At this point the usual sand overburden has been washed off by recent high water, and a depth of from 3 to 5 feet of profitable post-Glacial gravels were found to overlie a false bed-rock of kaolinized material over an area 225 by 50 feet.

Leases of J. Johnston and G. R. Baker. Two adjoining leases held by J. Johnston and G. R. Baker cover the ground on both sides of the river in the vicinity of the lower end of 10-Mile Canyon. The property is reached by a trail 5 to 6 miles in length which leaves the Quesnel-Barkerville Road at 16-Mile Lake, 16 miles from Quesnel, and, crossing the plateau, follows Frye Creek closely to a camp situated on the left bank of the river, 90 feet above it. The plateau is somewhat broken by gullies and is generally well timbered. At most places, even in the wide parts, the ground falls away sharply from the plateau at the rims of the valley and the latter part of the trail is steep.

That part of the property lying west of the river comprises a terraced gravel-bench area, on which are extensive old workings. The benches are situated at various elevations, from a few feet up to 90 feet above the river, and are covered with timber and vegetation. This part adjoins the lease of Alex. Madison, of which the location of the eastern boundary is not exactly known to the writer. Much of the descriptive matter relating to the Madison lease applies also to that part of the property under description lying west of the river.

On the part of the property lying east of the river the banks of the river rise abruptly in the canyon, and below the latter quite steeply to a broken roughly-terraced, well-timbered area lying about 80 feet above the river. At a comparatively short distance from the river the ground again rises sharply.

The mode of placer occurrence exhibited on this property at the point at which the workings are situated, at the mouth of 10-Mile Canyon on the top of the canyon-wall, on the east side of the river, is a post-Glacial concentration on the left wall of the canyon. It is clearly indicated, however, that more immediately instream from the canyon a pre-Glacial channel-segment of the river lies deeply buried in its left bank and extends beyond this property. The total length of this buried channel-segment is about 1 mile, and the river, both at the head and at the mouth of the canyon, cuts more or less directly across its ancient channel. The down-stream continuation of the channel through this property probably lies west of the river. Somewhat below the mouth of the canyon, about 50 feet above the river on the left bank, partly-cemented gravels are exposed, which from their residual character

are quite possibly pre-Glacial. These gravels are covered by glacial debris. The depth to bed-rock is quite unknown.

The formation exposed at the lower end of the canyon is coarse-grained diorite, pegmatitic at some points, which contains local segregations of feldspar crystals up to 3 inches in length. Farther up the canyon ultrabasic phases of batholithic rock are exposed.

A thickness of about 2½ feet of gravels composed entirely of diorite pebbles immediately overlies a rock bench, composed of diorite, 85 feet above the river. The gravels are overlain by a thickness of from 10 to 12 feet of tight sand and silt and can readily be mined separately owing to the indurated character of the overburden. At the time of examination gravels with overburden were exposed over a length of 65 feet fronting the river. The method followed was to mine the gravels separate from the sand and silt overburden and shovel them into a chute to a bin at river-level, at which point they were washed in a sluice-flume. The extent of these gravels had not been ascertained at the time of examination. The gold occurs mainly as coarse flakes. Four pans taken by the writer of the gravels only, indicated values per cubic yard of \$10.86 in gold and 30 cents in platinum (gold valued at \$35 per ounce and platinum at \$40 per ounce). These values do not represent the average values of the ground in place. It is understood that the owners are about to install a small pump operated by a gasoline-engine to facilitate washing. It might be mentioned that a small lake, situated about 1¾ miles distant and about 215 feet above this rock bench, might constitute a useful source of water, if developments should justify the expense involved. This winter the driving of a tunnel following the rock-bench gravels is contemplated. This will ascertain the point at which the rock bench pitches instream to form the right rim of the buried pre-Glacial channel. It does not, however, follow that, even if the rock should pitch sharply, values will also pitch downward. It frequently happens in such cases that values continue at approximately their former level on rock, if some suitable false bed-rock material exists at this horizon. There are other points near the canyon where the advisability of testing is indicated.

Lease of H. Conrad. This lease is situated at the head of 10-Mile Canyon and is reached by a branch trail leading from the Johnston and Baker leases. The ground includes a low-lying bench-area on the left bank of the river at the head of the canyon, at the upper end of the pre-Glacial segment of the channel which is indicated as lying buried instream from the canyon in the left bank. Close investigation at this point seems warranted not only in view of the position of the ground, but also because at some points promising pan-samples have been obtained. Opposite this point gravels overlying a rock bench on the right bank of the river were extensively worked by early miners, who brought in water from Deep Creek by ditch-line for the purpose. The concentration at this point was presumably due to the river cutting across its former channel. At the time of examination the owner was working on a productive bar on the right bank of the river to acquire funds for further prospecting.

Leases of E. McMillan and Mrs. McMillan. Two leases held by E. McMillan and Mrs. McMillan cover both sides of the river down-stream from a point about opposite the mouth of Boyd Creek. The property is reached by a trail about 4 miles in length from the top of 20-Mile Hill on the Quesnel-Barkerville Road, distant 20 miles from Quesnel. From the highway the trail ascends gradually for 1 mile to the well-timbered plateau and then descends gradually for 2 miles to the rock-rim of the valley, then more sharply for the remaining distance of 1 mile to a cabin by the river in the central part of the lease.

In addition to river-bars, the property covers, in part, an extensive low-lying, well-timbered bench on the left bank of the river. At the lower end of the property the main rock-rim of the valley, which is composed of andesite, rises gradually from the river and, trending instream, rises more sharply south-easterly to leave between it and the river the large bench mentioned.

Productive bars of considerable extent are situated on both sides of the river on the lower part of the ground. The average of three pans taken by the writer from bars indicated values per cubic yard of \$4.69 in gold and 7.8 cents in platinum (gold valued at \$35 per ounce and platinum at \$40 per ounce).

In the central part of the ground the large low-lying bench mentioned proved productive near the river, where a varying depth of sand up to 7 feet overlies a depth of 6 feet of pay-gravels resting on a false bed-rock of slum. Two pans taken by the writer from gravels only,

indicated values per cubic yard of 97 cents in gold (gold valued at \$35 per ounce). Values are stated to be best on this false bed-rock.

In this region the river apparently flows over indurated deposits, believed to be of inter-Glacial age, because where exposed immediately above the large flat mentioned they contain well-carbonized seams of lignite, one of which is 10 inches in thickness. Argillites are exposed in the bank of the river at the up-stream end of the large, well-timbered flat. It is apparent that the post-Glacial waters formerly swept instream over the ground now occupied by the low-lying bench or flat, which is presumably underlain by indurated glacial deposits. If so, it is quite possible that profitable gravels may extend down to the false bed-rock formed by this indurated material, and it is suggested that testing is warranted to determine average values in place. It is to be borne in mind that there will probably be a barren sand overburden.

WINGDAM AREA.

Although placer deposits of post-Glacial age occur in this area, it is the buried deposits that are of major importance. The area includes the contact between the Precambrian and Mesozoic rocks. The rocks bordering this contact, between Wingdam and Spanish Mountain, are of much interest because important placer deposits, now deeply buried, have been laid down on the rocks of both ages. The two chief contributions to the present year's output were derived from operations on these border-rocks—namely, those of Consolidated Gold Alluvials of B.C., Limited, on the Precambrian rocks, and those of Bullion Placers, Limited, on the Mesozoic rocks.

This company was incorporated in the State of Washington, U.S.A., in 1932, with registered office at 1410 Hoge Building, Seattle. The purpose was to acquire and operate certain placer-mining leases formerly owned by W. C.

Slade-Cariboo Gold Placers, Ltd. Slade and associates on Mostique Creek (formerly named Mosquito Creek). Additional leases were subsequently staked and the company now holds Placer-mining Leases Nos. 2233, 2334, 2383, 2516, 2530, 2563, 2531, and 2679, covering the creek from its junction with Lightning Creek to a point about 2¾ miles up-stream, just beyond the divide between the valleys of Lightning and Sovereign Creeks.

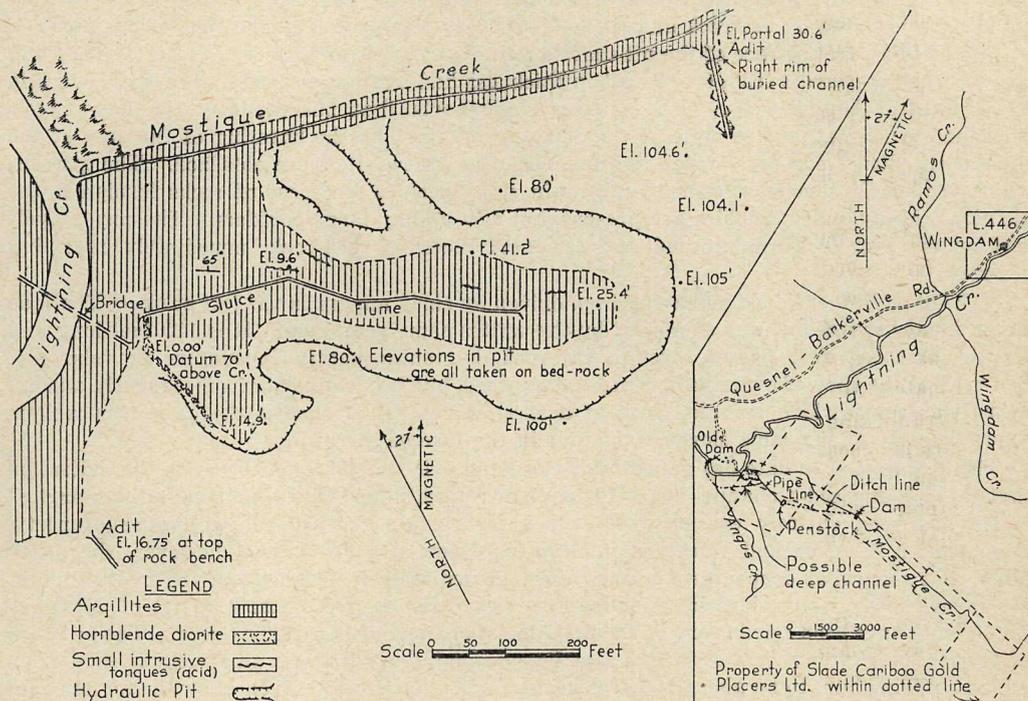
The property is situated on the south side of Lightning Creek. The camp on the north side of Lightning Creek is reached by a short branch road half a mile in length, passable for motor traffic, which leaves the Quesnel-Barkerville Road at a point about 3 miles west of Wingdam. A bridge across Lightning Creek just below the camp gives ready access to the company's hydraulic pit on the south bank of the creek.

Mostique Creek rises north of the company's property, flows south-westerly in its upper reaches, then makes a sharp turn to flow north-west after entering a succession of meadows and muskegs contained in a wide valley of mature relief, which slopes gradually in both directions at the divide between Lightning and Sovereign Creeks. From the summit of the divide Mostique Creek flows on a gentle gradient for about 1¾ miles to the point at which the company's dam is situated, the fall in this distance being determined by aneroid as 135 feet. The fall in the next three-quarters of a mile is 180 feet, and then rapidly increases in the gorge through which it flows to enter Lightning Creek at a point about 3 miles below Wingdam. The wide valley mentioned at the divide between Lightning and Sovereign Creeks is also occupied by a small unnamed creek flowing south-easterly into Sovereign Creek. Near the latter the valley narrows rapidly and the creek cascades down a rocky gorge immediately before entering its master-valley. It is therefore evident that the wide valley mentioned is a hanging-valley with respect to both Lightning and Sovereign Creeks. The region is well timbered, save where the floor of the valley is occupied by meadows and muskegs. Lightning Creek is confined in a canyon in the vicinity of Mostique and Angus Creeks. On the south side the steep rock wall rises to a height of 70 feet or more above the creek. This rock bench is overlain by a considerable thickness of glacial material, save where the latter has been resorted by post-Glacial waters, with the formation of placer deposits upon the rock bench above the canyon.

The most important type of placer deposit exemplified on this property is that of a buried channel. Topographic features and other facts clearly indicate that an earlier channel-segment of Mostique Creek lies buried in its left bank near the mouth of the creek, but the exact down-stream course of this channel, likewise the point at which it enters Lightning Creek, have not yet been clearly revealed by the work undertaken.

The property is noted for the coarse nuggets found, but fine gold is also present, originating mainly from the post-Glacial gravels overlying the deposit.

The area is underlain by Mesozoic rocks and is situated close to the contact between the Mesozoic and Precambrian. Where exposed on this property, the formation consists of argillites, which in the floor of the hydraulic pit are intruded by a tongue of hornblende diorite and small acidic tongues of batholithic rock. The strike of the argillites in the pit varies from north 23 degrees west to north 53 degrees west and the dip is north-easterly at about 65 degrees. In the vicinity of the intrusives mentioned, small irregular quartz veins up to 2½ feet in width occur in the acid intrusives and also in the argillites. Other quartz veins are exposed in Lightning Creek Canyon. The formation eroded is likely to have afforded a source for the formation of bed-rock placer deposits in Tertiary times.



Slade-Cariboo Gold Placers, Ltd. Plan showing Workings and Location of Property.
From Survey by H. Pattinson, B.C.L.S.

Gold was first found on Mostique Creek just above the gorge, and the post-Glacial deposits laid down on the bed of the creek were worked by early miners. It was evidently apparent to the latter that a buried channel lay instream in the left bank, because at that time at the upper end of the gorge an adit was driven in the left bank of the creek, which passed through the right rim of the buried channel above bed-rock. In later years a man named McPhail commenced hydraulicking at the top of the left wall of Lightning Creek Canyon about 200 feet down-stream from Mostique Creek. In 1926 the property was acquired by Caribou Mining Company, which confined its efforts to a small amount of prospecting. The following year W. C. Slade and associates became owners, and for some years thereafter W. C. Slade worked single-handed constructing a dam on Mostique Creek and bringing in a small supply of water for hydraulicking. Single-handed he continued hydraulicking, at the point where McPhail started, as long as the water-supply lasted each year, until 1932, when the ground was acquired by the present company. In 1932 the water-supply was greatly improved by construction of a storage-dam 20 feet high on Mostique Creek; a ditch-line for conveying water to the penstock; and a pipe-line from the latter to the pit under a head of about 200 feet. The size of nozzle used varies from 4 to 6 inches, depending on the water available. (Refer to Annual Reports of the Minister of Mines for the years 1926, 1930, 1931, 1932, and 1933.)

In 1933, on completion of the hydraulic installation, operations were continued at the point of commencement by earlier operators. At this point, bed-rock at the outlet of the sluice-flume is 70 feet above Lightning Creek; consequently dump facilities are very good. The pit has now been advanced for about 700 feet in a south-easterly direction. Operations have disclosed that the bed-rock gradually rises towards Mostique Creek and is somewhat higher on the north side of the pit than in the centre. There is no marked rise of bed-rock on the south side of the pit, but as the rock more immediately down-stream is somewhat higher than at the mouth of the pit, the suggestion is that a wide channel lies instream in the left bank of Mostique Creek. Gravels from 6 to 10 feet in thickness generally overlie bed-rock and are in turn overlain by much blue and yellow boulder-clay, on the top of which has been deposited 6 to 8 feet of post-Glacial gravels. The coarse gold is contained in cracks and crevices of bed-rock and in the gravels. During the entire season of 1935 the pit-face disclosed only boulder-clay resting on bed-rock and the gold-recovery was poor. At the time of examination in July of this year the face of the pit showed a total thickness of 75 feet of material overlying bed-rock. Pay-gravels from 6 to 8 feet in thickness had again appeared on bed-rock, overlain by 60 feet of boulder-clay. The management reports that subsequently the pay-gravels thickened to 10 feet, and in spite of the damage sustained by the bursting of the dam at the time of the disastrous high water in June, encouraging results were obtained. The gravels, which are locally somewhat cemented, contain many pebbles composed of rocks foreign to the vicinity. Many quartz pebbles are present, but few unduly large boulders. The pay-gravels rest on more or less comminuted and cemented pieces of bed-rock immediately overlying bed-rock.

The old adit mentioned as having been driven by early miners in the left bank of Mostique Creek is now caved, but was examined by the writer some years ago. It is 120 feet long and for the first few feet passes through rim-rock, but subsequently encounters gravels only. Bed-rock at the time of examination was not exposed, but it is stated that subsequently a small winze was sunk, which revealed rock at a shallow depth. If that is the case, this rock is approximately at the same elevation as that in the face of the pit.

Hydraulicizing to date has failed to disclose any evidence incompatible with the indication that there is exposed a channel about 70 feet above Lightning Creek, the down-stream part of which has been entirely eroded were it not for certain features on adjoining property. Topographic features and workings immediately down-stream suggest, however, the possibility that somewhat deeper ground may exist immediately instream from the hydraulic pit. Moreover, general considerations incline the view that a pre-Glacial channel of Mostique Creek must have been a tributary of the pre-Glacial channel of Lightning Creek. The bed-rock of the latter is known both from the *Big Bonanza* mine-workings in this vicinity, and from others at Wingdam, to be about 165 feet below Lightning Creek. Even allowing for the fact that the pre-Glacial channel of Lightning Creek lies considerably north of the present position of this creek, the bed-rock of the company's hydraulic pit seems too high to admit of a junction on normal grade with its master-channel.

Immediately down-stream from the company's hydraulic pit the rock-rim of Lightning Creek Canyon rises to about 16 feet above the western end of the pit-floor, and continues at that level to and beyond Angus Creek. Near Lightning Creek on this rock bench were originally post-Glacial placer deposits, extensively worked by the early miners, who made persistent attempts to follow the gravels instream, only to find that in this direction the rock dipped sharply away from Lightning Creek. In recent years, W. C. Mading opened up a hydraulic pit, 325 feet long, 100 feet wide, and 40 feet deep, 575 feet down-stream from the company's pit, starting at the instream edge of the rock mentioned. The rock at this point was found to dip sharply instream. Angus Creek, about 500 feet farther down-stream, flows through a rocky gorge incised in the rock-ledge bordering Lightning Creek Canyon. Above this gorge bed-rock is not exposed on Angus Creek for about 1,000 feet. At the site of the old dam of the *Big Bonanza* mine, Lightning Creek emerges from its canyon and a draw enters the valley of this creek from the south. Immediately below this point, on the left bank of Lightning Creek, placer deposits on low-lying post-Glacial rock benches were extensively worked by the early miners. These facts suggest the possibility that the pre-Glacial channel of Mostique Creek may lie immediately instream from the company's hydraulic pit, and that its down-stream course may be more or less parallel to Lightning Creek, emerging in the valley

of the latter at the site of the old dam. The foregoing considerations merely imply that the pre-Glacial channel of Mostique Creek may be somewhat wider and deeper than originally contemplated. Much light will, however, very shortly be thrown on this matter by the continuation of present hydraulic operations. The buried channel seems likely to prove of considerable extent.

MCLEOD RIVER AREA.

Placer occurrence on the McLeod and McDougall Rivers consists of concentrations on river-bars, gravel benches, and low-lying rock benches. The last-mentioned type of deposit is of frequent occurrence on the McLeod River. Metals of the platinum group usually accompany the gold to some extent.

Numerous quartz veins, some large, but of lenticular character, in main sparsely mineralized, occur in the region lying immediately north of the McLeod River and east of the south-easterly-flowing part of the McDougall River. These veins occur in schistose argillites, and also as gash-veins, mainly, in metamorphic rocks. Pyroxenite and also acid types of batholithic rocks occur on the right bank of the McLeod River about 1½ miles down-stream from the mouth of McDougall River. Pyritized acidic batholithic apophyses occur close to the Fort McLeod-Philip Creek Trail, 7½ miles west of Fort McLeod. This fact, coupled with the known trend of the Cassiar-Omineca batholith, which outcrops for many miles from Mount Milligan north-west, suggests that the batholith underlies the region under description, but has not been greatly unroofed therein. The quartz veins mentioned probably originate from the batholith and are likely to follow its indicated course. As there is but little evidence of any veins being cut by the McLeod River, it seems probable that they will be found to trend north-west rather than south-east of this river. Further, it seems likely that the McDougall River marks about the western limit of their distribution. Appreciable gold values were not found in any of the veins examined, but as they are somewhat widely distributed it is possible that gold-bearing veins may occur. The presence of pyroxenite suggests the local origin of the metals of the platinum group. The gold is indicated as being of closely-local origin, although certainly derived in part from glacial materials. That on some of the rock benches, especially those on the McLeod River, may be of strictly local origin.

There is marked evidence that the ice-sheet moved south-east across this area. The glacial debris adjacent to the rivers contains a large proportion of material derived from the garnetiferous and mica-bearing rocks of Precambrian age cut by the rivers in their upper reaches, and the placer gravels contain numerous garnets.

As to the evidence of pre-Glacial channel-segments: In the right bank of the McLeod River, 1½ miles down-stream from the mouth of the McDougall River, topographic features suggest the existence of a buried segment of a former channel of the river, instream from a low-lying rock bench at this point. The pre-Glacial age of this channel is indicated by deeply-decayed rock immediately overlain by gravels containing many pebbles of pyroxenite, which outcrops at the end of the bench. It is also indicated by topographic features that an extensive pre-Glacial channel-segment of the McDougall River lies deeply buried instream in the left bank of that river below Reed Creek.

From what is known, however, of the distribution of the quartz veins, the pre-Glacial channel-segments mentioned do not seem to have eroded the most favourable terrain in the region for the formation of rich bed-rock placer deposits.

This company was incorporated in 1934, with registered office at 1405 Douglas Street, Victoria. The placer leases held are numbered 690, 691, and 692, **Northern Reef Gold Mines, Ltd.** and their location is shown on the accompanying map. The property covers part of a large terraced gravel flat situated on the left bank of the river immediately below Reed Creek, where the river makes several sharp turns, forming a large bend. This flat rises gradually instream in low terraces to a maximum height of about 25 feet above the river. In places the flat is lightly timbered. It is roughly semicircular in shape, and the maximum length is about 3,000 feet and the maximum width about 1,500 feet. At the instream extremity of this flat, high, terraced, glacial banks rise sharply to the plateau-level, 200 feet above the river. Timber is chiefly second growth, save for local stands, as the region is in a burnt area. Farther instream the plateau rises gradually to about another 100 feet above the river. Prominent features of the large flat are, at the down-stream end, two rock knolls, about 40 feet high, of elliptic shape, lying parallel to one another, the larger of which

risers abruptly from the river of which it forms the left bank at this point. Rock also outcrops at the point where Trent Creek enters the flat. Immediately below the flat the river enters a steep-sided rock-walled valley.

After preliminary investigation, the company proceeded to install a hydraulic plant. The project involved bringing in a water-supply from Green Timber Lake; the construction of three dams near this lake, and about 8,500 running feet of ditch-line to a penstock situated at the top of a glacial bank 200 feet above the river; and the laying of a 24-inch main pipe-line, with two 16-inch branch lines from penstock to point of hydraulicking on the large flat previously mentioned. A sawmill of 10,000 feet board-measure daily capacity was also installed, camp buildings erected, and an Allis-Chalmers caterpillar tractor and Kirk-Hillman placer-drill hauled to the property. This installation was completed in 1935, and that year, after carrying out some drilling and hydraulicking, operations were suspended. (Refer to Annual Reports of the Minister of Mines for the years 1932 to 1935, inclusive.)

At the down-stream end of the flat as shown on the accompanying map two hydraulic pits and one long cut were opened up from the river-level. It is not known to the writer what amount of gold was recovered from these operations.

A small hydraulic pit, No. 1, follows the bed-rock of Trent Creek to near its face, where bed-rock disappears below the pit-floor. Overlying the bed-rock are post-Glacial gravels about 5 feet in depth.

No. 2 hydraulic pit, maximum width 80 feet and maximum depth at face 24 feet, exposes bed-rock in the floor. The face of this pit had sloughed considerably at the time of examination, but at the top were exposed 2 to 3 feet of sand overlying from 4 to 6 feet of gravels. Underlying the latter was a stratum of silt resting on clay and glacial debris containing many large boulders. The disposal of the latter evidently proved difficult. It is apparent from an examination of this pit that the post-Glacial waters have not at this point swept down to the underlying rock, and that values are therefore likely to be confined to gravels overlying the glacial deposit.

Somewhat down-stream from No. 2 hydraulic pit a long open-cut, 10 feet deep, was made up from the river-level apparently to test the ground between the two knolls. This cut exposed argillite at the point shown on the map. It is likely that the post-Glacial waters swept between these knolls, but from No. 2 hydraulic pit it is evident that they did not cut to any great depth.

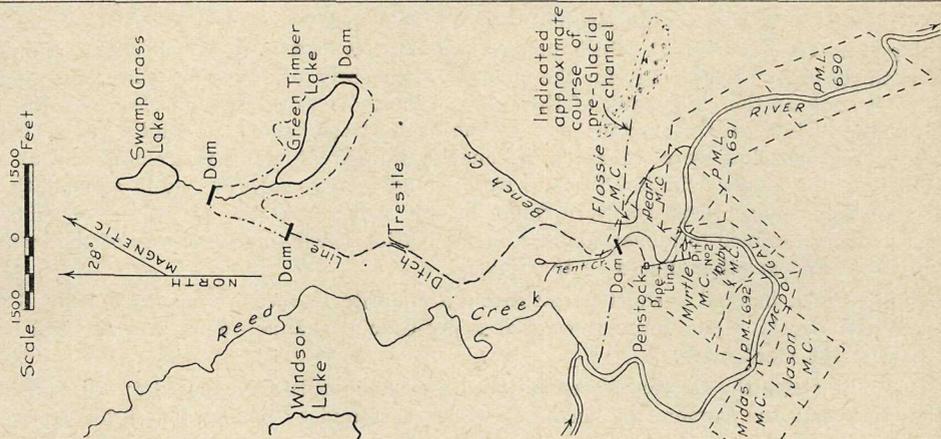
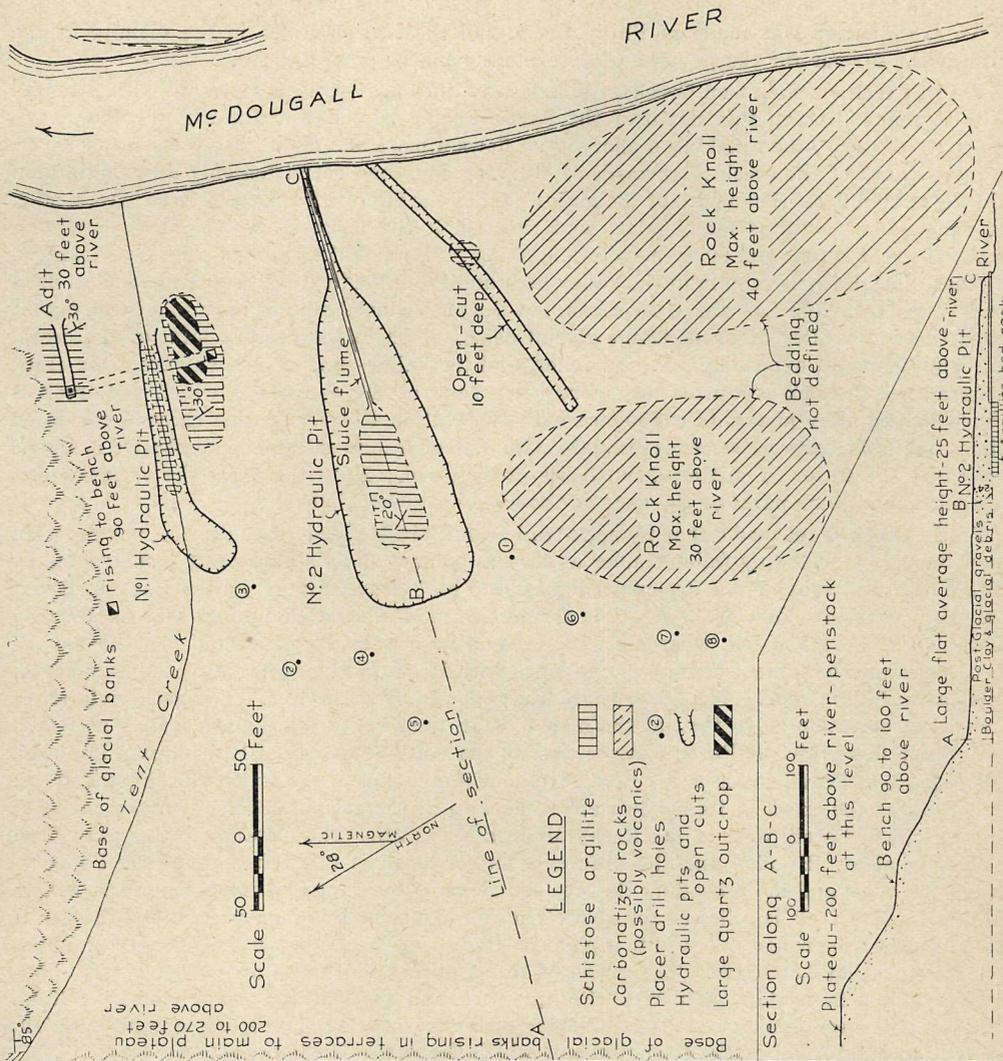
At the points shown on the accompanying map, eight holes were drilled on the flat, and four holes on a bench 90 to 100 feet above the river. The depth of these holes and values encountered are not known to the writer.

There is much in the surrounding topographic features to suggest that a pre-Glacial channel-segment of the McDougall River lies buried instream from the large flat described, under the high glacial banks. Its suggested course lies between a point on the McDougall River somewhat down-stream from the mouth of Reed Creek and the south end of Snowshoe Lake. From this point its course was probably about due east to its junction with the McLeod River. Much further detailed field-work, however, would be necessary to form an accurate opinion on this matter. Owing to deep burial, testing by means of Keystone-drilling will prove expensive, and although bed-rock values quite possibly exist, their commercial recovery involves serious consideration.

It is apparent that the obvious placer concentrations on this property are certain bars in the river, of limited extent, and post-Glacial concentrations on the large flat described. The latter type are likely to exemplify that spotty distribution of values characteristic of deposits of this type. Values will be superficial, except that if rock not now exposed underlies any part of this bench at shallow depth, concentration may extend down to it, provided post-Glacial waters have cut to that level, but not otherwise. To obtain an accurate opinion as to *average values in place* of the gravels on the large flat would necessitate detailed investigation.

Any concentration on the high glacial banks, where the latter do not overlie the pre-Glacial channel-segment mentioned, must be purely superficial, and whether such are commercial is problematical.

Apart from the pre-Glacial channel-segment mentioned, it is evident that the attitude of all obvious concentrations of placer on this property is more or less horizontal.



Northern Reef Gold Mines, Ltd. Plan showing Workings and Location of Property. Pace and Compass Survey.

PHILIP CREEK AREA.

An examination was made of Philip Creek and the Nation River in the vicinity of the mouth of the former for the purpose of determining placer potentialities.

Philip Creek, or Robinson Creek as it is locally known, rises in a series of lakes situated on the Nechako Plateau just north of the Arctic-Pacific Divide, and for the first few miles flows south-easterly, then making a sharp turn flows almost due north into the Nation River. The total length of the creek is upwards of 40 miles, but time permitted only an examination of the lower 20 miles. The width of the major part of the valley of this creek is at least a mile. This wide valley contains many lakes, and through it the large creek meanders, low-lying benches of great extent and many meadows flanking both its banks. Large masses of terraced and other glacial debris remain in the valley here and there, and extensive gravel benches have been formed, up to 100 feet above the creek, but the post-Glacial waters have to a large extent cleared the wide valley of pre-existent glacial debris down to the present level of the creek. The region is one of extremely-matured relief, and the valley-rims slope away from the creek very gradually. Rock-exposures are infrequent, save in the canyon in which the creek is confined immediately above its confluence with the Nation River. In this canyon, composed of limestone-beds, are rock benches overlain with gravels representing the successive channels occupied by the water in cutting down to its present bed. Near the creek the valley-slopes, the benches, and some parts of the floor of the valley are well timbered.

Philip Creek is reached either by pack-trail from Fort McLeod (a route which is reported as now being obstructed by fallen timber at several points) or by a pack-trail (constructed by H. M. Witter and sons) from Pre-emption Lot 9615 on "Scovil Flats" on the Parsnip River, about 25 miles below Fort McLeod. The former route offers the advantage that horses may be obtained at Fort McLeod, whereas if the alternative route is selected and pack-horses are desired, arrangements must be made in advance with H. M. Witter, who keeps the only horses available on Philip Creek. The latter route was followed by the writer. The pack-trail leaves the river, at elevation 2,070 feet, at the mouth of an unnamed creek, known locally as Scovil Creek, which flows into the Parsnip River close to the south boundary of Pre-emption Lot 9615. The left bank of Scovil Creek is followed for about 8 miles up to the forks, and thereafter the North Fork of the creek to its headwaters in a pass, at elevation 4,330 feet, in the range of mountains immediately west of the Rocky Mountain Trench. The distance to this pass from the river is about 12 miles and the difference in elevation is 2,260 feet. The trail follows through the pass, and in descending the western slope of the range an unnamed creek, known locally as Cache Creek, is followed for about 3 miles. This creek is then crossed and the gentle western slope of the range followed to a point on Philip Creek just below the junction of Wheel Creek, at elevation 2,555 feet. The grade of this trail is good, there are but few soft spots, and save in the immediate vicinity of Philip Creek and the Parsnip River timber is light. On the summit and higher parts of both slopes rock-exposures are numerous, and an excellent cross-section is afforded of the formations of which the range is composed.

Evidence of the earliest placer-mining in Philip Creek Valley is afforded by certain old workings on Wheel Creek, at which point a water-wheel, parts of which still remain, was erected thirty or forty years ago for the purpose, apparently, of supplying power for pumping in a shaft sunk on the right bank of the creek. These old workings and others on the same creek in the vicinity are not extensive. At the head of the canyon on Philip Creek, gravels overlying rock benches were worked to a considerable extent many years ago, and at other places along the canyon similar deposits were found. It is, however, quite evident that no really extensive placer deposits were found in this valley. At the present time, mining is almost entirely confined to numerous bars on the Nation River in the vicinity of the mouth of Philip Creek and at other places on the river.

Philip Creek has cut a short gorge through andesite in recent times at a point 6 miles below Wheel Creek. This gorge is west of a pre-Glacial channel-segment which lies buried instream in the right bank.

One mile above the canyon aforementioned, limestone-beds are exposed on the right bank of the creek, and the canyon, the length of which, as found by pacing, was 8,387 feet, is cut entirely in dark-coloured or black limestone-beds, argillaceous at some points. The height of the walls of the canyon varies from 10 to 150 feet. The strike of the limestone-beds varies

from north 70 degrees east to north 80 degrees west and the dip is southerly, varying from 45 to 80 degrees.

The route followed by the trail affords an excellent cross-section of the formations exposed in the higher slopes of the valley. At 740 feet above the creek schistose green-coloured quartzites are exposed, striking north 45 degrees west and dipping at from 60 to 75 degrees north-east. Intercalated apparently with these and exposed almost continuously on the higher slopes to the summit, and also over the latter on the Upper Parsnip River slopes, are gneissic diorite and less basic gneisses. On the Parsnip River slope at 625 feet above the river are extensive outcrops of coarsely-crystalline gneissic rocks composed of quartz, feldspar, and muscovite, which closely resemble a narrow belt of rocks known to outcrop at intervals for hundreds of miles immediately west of the Rocky Mountain Trench.

Very little evidence of mineralization was observed in the rocks exposed. In the bed of Philip Creek just above the canyon a quartz vein was seen, and the schistose quartzites mentioned on the higher valley-slopes contain a few quartz stringers. It is strikingly evident that in Tertiary times a remarkable amount of prolonged and largely uninterrupted erosion was accomplished by this creek. In this respect conditions were ideal for the formation of pre-Glacial bed-rock placer deposits, but there is no evidence to indicate that the terrain eroded was definitely auriferous. From what is known, this creek lies east of what may be a mineralized area. No definite evidence was found to indicate that commercial placer deposits will be found on bed-rock where its present course coincides with its pre-Glacial course, or in any buried pre-Glacial segments.

Within the part examined, the creek flows over boulder-clay, in part resorted, in its upper reaches. Boulder-clay also underlies, at shallow depth at places near the creek, post-Glacial gravels, in which fair prospects of placer may be obtained at some points. On Wheel Creek it is apparent that the placer deposits investigated by early miners overlie indurated slum or other glacial material. In the canyon, rock-bench deposits of post-Glacial age occur at various elevations above the creek, and at the head of the canyon the lower-lying benches were worked to a considerable extent in early days, and apparently proved productive.

It seems reasonable, however, to infer that the glacial debris, which is apparently the source of all occurrences of placer on this creek, was not markedly auriferous, or by this time more evidence of productive post-Glacial deposits would have been found. While, however, this creek cannot be specifically recommended for prospecting *per se*, prospectors who have occasion to traverse it for any reason might be well advised to pan the gravels overlying the widely-distributed clay false bed-rock at various points in the hope of finding some deposit which has hitherto escaped notice.

Pan-samples taken by the writer from gravels overlying clay at two points on the right bank of the creek, about 6 miles above Wheel Creek, indicated values of 25 cents and 6 cents per cubic yard respectively. A few pans were taken at a point about 6 miles below Wheel Creek from gravels overlying a rock bench 60 feet above the creek, but only a few colours were obtained (gold valued at \$35 per ounce).

Wheel Creek.—This creek is of considerable size and flows north-westerly into Philip Creek. About a quarter of a mile above its mouth a tributary comes in from its north side. This tributary is incorrectly shown as Wheel Creek on maps, and the position of the main creek on which the old placer-workings exist is not shown. About 1½ miles above the mouth of Wheel Creek (main creek) are several old workings within a distance of about half a mile on the right bank of the creek, and on the left bank stands an old cabin. In this region the creek flows over either indurated slum or glacial clay, and on the false bed-rock formed by this material the auriferous post-Glacial deposits are found that were the subject of investigation by early miners. The deposits occurred as low-lying gravel benches immediately adjacent to the creek. None of the old workings are extensive. At one point a caved shaft, and the ruins of an overshot water-wheel, 10 feet in diameter, and dam and flume for supplying water for operating the wheel, seem to indicate an attempt to sink on the right bank of the creek, the purpose of the wheel being presumably to operate a Cornish pump. For unknown reasons the project was abandoned before much work was accomplished. Pan-samples taken from the creek-gravels opposite the shaft showed colours of gold. It was noted that the bed of the creek in which these old workings are situated contained glacial boulders of larger size than

at other places. No outcrops of bed-rock were observed in the part of the creek examined, but at several places indurated glacial debris is exposed.

Nation River.—This river was examined from the mouth of Philip Creek down-stream for about 4 miles to the head of a canyon. In this region low-lying gravel benches of very great extent, covered with timber, flank both banks of the river, and behind them gravel terraces rise to a height of about 100 feet above the river, the highest extending into Philip Creek Valley above the canyon.

The best and safest means of access to this part of the river is afforded by either of the routes mentioned in the opening paragraphs of this report. A horse-trail follows the right bank of Philip Creek throughout the greater part of its length to the upper end of the canyon, and at this point leads over the steep ridge between Philip Creek and Nation River Valleys.

It is possible to navigate the Nation River by motor-boat from its mouth up to Philip Creek, with various portages, but recent regrettable fatalities prove that it is a hazardous undertaking and should not be attempted even by experienced rivermen.

The placer occurrences on this river which engage the present attention of prospectors are the numerous bars which flank the very extensive low-lying benches to which reference has already been made. At the time of examination several parties well equipped with motor-boats and small pumps operated by gasoline-engines were working at different places on the river. The bars were reported to be productive by those queried.

No systematic attempt has been made to ascertain average values in the very extensive low-lying benches. Values therein are, in the absence of investigation, largely a matter of inference from topographic features studied in the light of known facts regarding placer occurrence. At the lower end of the extensive flats the river enters the first of several rock canyons. Canyons also occur on the river above Philip Creek. It seems evident that these low-lying benches overlie pre-Glacial channel-segments of the river, but the depth to bed-rock is a matter of conjecture. The region lies east of known gold-bearing areas, which presumably furnished the gold found on the river-bars. Unless, therefore, detailed local examination of the formations in this region inclines a contrary view, there seems to be no very definite reason for inferring that commercial bed-rock values are likely to underlie these benches. It is possible, of course, that post-Glacial concentrations on indurated glacial material, lying above bed-rock, may have been affected, apart from any purely superficial concentration, which will doubtless be found at some places instream on these benches. To date, prospectors have worked these benches only for a few feet instream, obviously because the outstream parts and bars are more productive. Several pan-samples were taken by the writer at one point about 3 miles below Philip Creek. Here, just instream from the river, the bench is composed of from 2½ to 4 feet of barren sand overlying about 1 foot of gravel just above water-level. Three pans taken at this point, of gravel only, indicated values of respectively 22 cents, \$1.15, and 57 cents per cubic yard of gravel. Another pan taken from the same place at the instream edge of the river-bar which flanks the bench indicated values of \$1.34 per cubic yard. Another taken at a point on the bench about 30 feet instream from the river indicated a value of 67 cents per cubic yard of gravel. Pans taken about 100 yards instream from this point and somewhat up-stream showed fine colours only. Another pan taken 130 yards down-stream from this point and 34 yards instream indicated values of 3 cents per cubic yard of gravel. It is to be noted that values given, except in the case of the samples from the river-bar, do not take account of the barren sand overburden, and are all based on a gold price of \$35 per ounce. Owing to the great size of the gravel benches a certain amount of systematic preliminary testing seems warranted. There are also several rock benches in Philip Creek Canyon which have not apparently been investigated, doubtless because of the difficulty of getting wash-water at this elevation without pumping.

SPECIAL REPORTS.

A limited number of mimeographed copies are available to those who specially request reports on the following properties:—

Richfield Cariboo Gold Mines, Limited.

McLeod River Area (Lode Gold), Northern Reef Gold Mines, Limited.

Ahbau Lake Area—Moosehorn.

The properties described in these reports are not considered to have reached a stage of development to be of sufficient interest as yet to warrant the inclusion of lengthy descriptions in the Annual Report.

PROGRESS NOTES.

LODE OPERATIONS.

BY

CHARLES GRAHAM.

Copper River District.

Dardenelles Group.—Omineca Gold Quartz Company, Limited; Fred Wells, president. Very little has been done on this group during the year, due probably to the washing-out of the Copper River Bridge in October, 1935, and which was again damaged in the big flood of the Skeena River in May this year. The bridge has been rebuilt and the trail to the property has been completed.

Usk District.

Columario Consolidated Gold Mines, Ltd.—This property did not operate during the year. *Nicholson Creek Mining Corporation.*—B. Shannon, manager. Some drifting was done during the early part of the year. Operations have been suspended for the present.

Hazelton District.

The *American Boy* mine has been acquired by new interests and it is expected that development will be commenced shortly.

Smithers District.

A small shipment of ore was made from the *Silver Pick* claims in the Babine Mountain area. Only assessment-work was done at any of the other properties.

Houston District.

Bob Creek.—Houston Gold Mines; G. W. Smith, manager. Seven men were employed for a few months during the summer doing some development-work and prospecting in the large dyke. There is a small mill on the property consisting of a crusher and table. The ore mined was put through the mill. Operations were suspended at the end of September.

There was no activity in lode-mining in any of the other districts in the Omineca Mining Division.

BY

THOMAS R. JACKSON.

Cariboo Area.

Cariboo Gold Quartz Mining Co., Ltd.—R. R. Rose, general manager; R. E. Vear, mine manager. Situated near the town of Wells. Underground work was continuous throughout the year and the mill operated, except for a period from March 23rd, when the power plant was burned down, until June 16th, when a new power plant was put into operation.

The new power-installation consists of three Rushton Diesels with a total of 1,300-horsepower at 4,000 feet elevation, which drive three Sullivan compressors that have a total of 3,000 cubic feet, free air, capacity; the above Diesels also drive the electric generators supplying electrical power and light.

The main haulage-adit, known as the 1,500 level, has reached 4,950 feet in length, and from this Nos. 1, 2, and 3 shafts have been sunk. No. 1 shaft has been sunk to the 1,700 level and is now being equipped with an electric hoist.

The levels above the 1,500 level are connected by raises to surface, which provide good natural ventilation and exits; the ventilation in long drifts being provided by fans.

During the year employees were provided with Edison electric safety-lamps.

On July 16th the mill capacity was increased from 150 tons to 200 tons per day and ran at this rate for the remainder of the year. Underground haulage is by storage-battery locomotives.

Development during the year consisted of 4,136 feet of drifting, 4,219 feet of crosscutting, 649 feet of raising, 103 feet of sinking, and 4,810 feet of diamond-drilling; 51,634 tons were mined, and this yielded 18,464 oz. of gold and 1,700 oz. of silver.

Island Mountain Mines, Ltd.—M. C. Banghart, general manager; C. Johnson, mill manager. The mine is situated close to Wells and operated continuously throughout the year with 120 men employed.

During the year a 3-compartment shaft was sunk to a depth of 528 feet from the main adit-level and levels started from this shaft. The electrical hoist installed at the new shaft is of modern design. The workings above the main level are connected to the surface by raises and this materially assists in providing natural ventilation of the workings.

Developments during the year consisted of 3,132 feet of drifting, 4,319 feet of crosscutting, 1,264 feet of raising, 528 feet of sinking, and 16,786 feet of diamond-drilling.

The tonnage mined was 43,649 tons, and this yielded 18,032 oz. of gold and 2,921 oz. of silver.

Quesnelle Quartz Mining Co., Ltd., Hixon, B.C.—Newton J. Ker, president, Russell Ross, manager. This mine is situated 6 miles east of Hixon and operated continuously from April with a crew of twelve men. The main shaft is 200 feet deep, and during the year a 2-compartment winze on a 75-degree slope was sunk from the lower level to a depth of 165 feet, and some drifting was done from it.

Natural ventilation so far has been adequate, but further developments will necessitate fan ventilation.

Development during the year consisted of 107 feet of drifting, 27 feet of raising, and 135 feet of sinking.

Some work was done during the year at the properties of Burns Mountain Gold Quartz Mines, Limited, and Cariboo Ledge Mines Company, Limited.

Likely Area.

*Mariner.**—At this property, situated on Spanish Mountain, owned by T. Bayley and F. Dickson, of Likely, a number of additional quartz veins were discovered. The veins occur mainly in alaskite, but also in schistose sediments. (Refer to Annual Report for 1933.)

*Fox.**—This group, owned by T. McGee and Alex. Dick, of Likely, is situated on the left bank of the Quesnel River, 2½ miles down-stream from Quesnel Forks.

MAGNETITE DEPOSITS.

Likely Area.

*Likely Gold Mining Syndicate.**—At the property owned by this syndicate, on the left bank of the South Fork of the Quesnel River, half a mile from Likely, surface-stripping and a short crosscut adit have exposed, in part, a lens of magnetite containing a certain amount of chalcopryite and pyrite.

MANGANESE DEPOSITS.*

The discovery of manganese in the vicinity of the Nechako River east of Fort Fraser is reported by A. Goodwin and others, of Fort Fraser. It is understood that manganese was discovered at two different points, and that an examination was made by an officer of the Geological Survey.

TUNGSTEN DEPOSITS.

Columbia Tungstens Co., Ltd.—Donald F. Fraser, manager. This mine is situated at Hardscrabble, about 6 miles from Wells, and consists of a 70-foot 2-compartment shaft in gravel, from which there is a 350-foot drift at the end of which a winze is down and drifting is carried on from this winze.

Prospecting for sheelite has been the chief work during the year.

* By Douglas Lay.

PLACER OPERATIONS.

BY

CHARLES GRAHAM.

There has been very marked activity in placer-mining during the past year, particularly by the DeGanahl interests of New York, who are operating on Germansen, Vital, and Harrison Creeks.

About 175 men were employed in these areas during the summer, working for wages, in addition to about thirty prospectors working on other creeks not visited.

Germansen River.

Germansen Creek Ventures.—H. McN. Fraser, superintendent. This company, owned by the DeGanahl interests, has acquired twelve leases on the lower end of the creek, near its junction with the Omineca River. It was late in the season before operations were started. A camp was rushed up at Germansen Landing and considerable preparatory work done. This is a hydraulic operation, but it was proposed to do some drifting during the winter to define the rims. Thirty-eight men were employed.

Slate Creek.

Consolidated Mining and Smelting Co.—W. M. Ogilvie, manager. A large drag-line scraper plant is installed, using a 2-yard bucket. A 60-horse-power "cat" bulldozer is used to break up the ground and push the gravel into the pit through which the drag-line operates, considerably increasing the yardage that the scraper can handle. Thirty-five men are employed and camp conditions are good. A radio set at the plant provides communications with Fort St. James, Anyox, and Trail.

Manson Creek.

Only individual miners were operating on Manson Creek.

Takla Lake District—Vital Creek.

Northern Ventures, Ltd.—J. J. Warren, manager. This property, originally worked as an underground operation by Chinese, was operated in 1934 by Juneau, Alaska, interests and in 1935 was acquired by the DeGanahl interests.

A second shaft was necessary if underground operations were to be continued, so the new owners decided to abandon underground mining and use hydraulic methods. Starting late in June, 1935, preparations were begun for hydraulic operations and considerable money was spent in ditches, flumes, and sluice-boxes for tailings-disposal. Hydraulic operations started in the late spring of 1936, but were abandoned during the summer as dumping facilities were insufficient to handle the great thickness of overburden. The equipment was moved to Harrison Creek, where the conditions for hydraulic operation are much more favourable.

A shaft was started to reach bed-rock just ahead of the old tunnel, which will serve for drainage and ventilation, but the outlet has been so damaged by hydraulicking that it will not be suitable or safe as a second exit. A steam-boiler and hoist have been installed.

Harrison Creek.

Harrison Creek.—This property, operated by Harrison Creek Ventures (E. Gibbons, manager), has also been acquired by the DeGanahl interests. During the summer preparations have been made for commencing hydraulic operations, and a fine camp has been constructed. A base camp has been erected at Takla Lake and considerable work done on road-construction from the lake to Harrison and Vital Creeks.

Prospecting is being carried on at Tom Creek, Quartz Creek, and other small creeks in the area.

BY

THOMAS R. JACKSON.

Wingdam Area.

Consolidated Gold Alluvials of B.C., Ltd.—This company operates at Wingdam, with D. Campbell-Mackenzie as general manager; Leroy S. Cokely, assistant manager; John Knowles,

mine manager. The workings are known as the Sanderson, Melvin, and No. 1 shafts respectively; the No. 1 shaft was inactive during the year.

The Sanderson shaft and workings are in gravel and require careful and close timbering. The system of work is by the pillar-and-stall method, and during the year 47,777 cubic yards of ground was taken out; this yielding \$210,482 in gold.

Ventilation is provided by a 6,000-cubic-foot-capacity fan. During the year a second exit was made by means of a slope driven 498 feet to the surface. Haulage is by means of a storage-battery locomotive and the workings throughout are provided with electric lights.

The Melvin shaft, sunk in rim-rock to a depth of 280 feet, or 60 feet below the bottom of the original channel of Lightning Creek, now has 1,921 feet of workings, including the main reef-drive under the old channel. Short offsets are made at 75-foot intervals from the main reef-drive, and from the offsets 4-inch diameter holes are drilled vertically up to the gravel above; these drill-holes are equipped with valves permitting control of the flow so that the drainage can be concentrated to one area and also limit the flow of water to the capacity of the pumps. When the pressure-gauges show that the water has been drained from the area above raises will be put up into the gravel and gold-recovery started. At the time of writing the first raise has been put up a distance of 62 feet and a short level driven into the gravel which had been previously dewatered.

Hydraulic Area.

*Bullion Placers, Ltd.**—The following data are kindly supplied by the management: Yardage piped during the year from *Bullion* pit, 960,000 cubic yards in 2,144 hours; a 10-inch nozzle under a head of 400 feet was employed on bed-rock and a 6-inch nozzle under a head of 100 feet on the upper gravels. Bank-blasting to promote safety was carried out, 4-inch holes being drilled to a depth of about 70 feet with an Airplane drill and blasted with 40 per cent. Polar Forcite. The extensive developments carried out included laying a new pipe-line to supply two 10-inch monitors in the South Fork pit. It is anticipated that not less than 1,250,000 cubic yards will be piped off next season. (Refer to Annual Report for 1935.)

Likely Area.

*Quesnel Mining Co., Ltd.**—This newly-incorporated private company has acquired twenty leases and one dredging lease on the North Fork of the Quesnel River, Spanish and Black Bear Creeks. A force of forty men was employed during the year in installation of hydraulic plant.

*Leases of A. L. Youngren and A. G. Youngren.**—These are situated on the right bank of the South Fork of the Quesnel River, distant half a mile from Likely. A. L. Youngren discovered coarse nuggety gold in gravels overlying rock consisting of interstratified argillite and conglomerate at 100 feet above the river.

Quesnel Area.

*B.C. Development Co., Ltd.**—This company is operating the property known as the *Tertiary* mine (described in the Annual Report for 1934). Messrs. Fraser and Peers, consulting engineers, report that a drift in the right rim of the channel was advanced up-stream a distance of 600 feet, and that a total footage of 475 feet of Keystone-drilling was accomplished.

*Horsefly Area.**

Two new discoveries, both situated close to the main road, are reported. These are:—

(a.) *That of A. N. Walker and Associates.*—The old "Soda Creek" shaft, sunk in the earliest days of mining to a depth of 65 feet, close to Horsefly, about 700 feet instream from the left bank of the Horsefly River, was unwatered.

(b.) *That of R. N. Campbell.*—The discovery of a buried river-channel is reported at a point about 1¼ miles west of Horsefly and distant about 400 yards south of the main road.

In both the above cases it is stated that a considerable amount of work was done subsequent to discovery. (Refer to Annual Report for 1931, containing a general account of the area, with map.)

* By Douglas Lay.

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