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REPORT

on

PRELIMINARY SURVEYS & GEOLOGICAL EXAMINATIONS

of

PLACER & LODE MINING PROSPECTS

near

ATLIN, B.C., ATLIN MINING DIVISION
BRITISH COLUMBIA

(N.T.S. MAPS 104N/11W-1/2; 104N/12E-1/2)

for

SURPRISE* RESOURCES LTD. (N.P.L.)
VANCOUVER, B.C., CANADA

by

W.M. Sharp, M.A.Sc., P.Eng. (B.C.)

during

June, 1973

INTRODUCTION

In accordance with the general directives and authorization provided by Mr. R. Day, the writer examined five designated mining prospects within the Atlin area during his June 4-12, 1973 visit. In addition, "background" trips were made to sites of current and past placer mining operations on the local creeks.

Four of the properties examined are held by T.O. and S.J. Connolly of Atlin via direct staking and/or acquisition of pre-existing leases. Locally, the above (basic) claim groups have been expanded, or may be further expanded by locations and acquisitions made on behalf of Company principals; Mr. Connolly has tentatively arranged for the acquisition of at least three placer mining leases on Spruce Creek.

In respect of the writer's placer examinations, no significant (central) sections of the old pay channel are currently exposed along the bed or banks of modern Otter Creek or, from present indications, along Wright Creek either. Consequently, current field and office investigations concerning the position and production potential of essentially buried 'pay channels' hinge mainly on indirect evidence of their position - supplemented by the rather general (re. actual locations) accounts from old reports and, to some extent, by geologically-based inferences.

Examination of the lode prospects was by standard preliminary mapping and sampling methods. The respective surveys adequately covered most of the existing exposures. However, some important sections were not accessible for examination and this fact is considered in the writer's preliminary evaluations and recommendations.

Over two field days were spent on the search and survey of claim posts and on survey work for the staking of protective and fill-in (fractional) claims.

Considerable field and 'office' assistance was provided by Mr./Mrs. T.O. Connolly and Mr. Don Roxborough, and is hereby thankfully acknowledged.

The preparation of the accompanying maps, particularly Dwg. No. 0-1, accounted for about one-half of the report preparation time, but in view of the lack of definitive information available, comprise an essential, if not the most important part of the report.

Dwg. No. 0-1 is based on fairly wide-ranging compass-chain/range-finder surveys by the writer and, in large part, on a 100-scale plan of lower Otter Creek kindly made available by Mr. M. White of Atlin - the latter map requiring conversion of old elevation data and subsequent reduction to 200-scale prior to combining it with writer's survey (plan).

Of the several maps and sketches made available, only the above 100-scale plan and the 1936 M.M. Report plan of Spruce Creek were sufficiently definitive for purposes of on-site survey planning or control.

GENERAL GEOLOGY

A - BEDROCK

From Wright Creek to, and through Spruce Creek, and for several miles southeast of Mt. Munro, the generally drift/alluvium-blanketed land surface is underlain mainly by rocks of the Cache Creek Group of Carboniferous age. These include hard and soft (locally ribby) cherts, argillites, chert-pebble conglomerate, quartzite, greenstone, limestone, etc. Within the chert-argillite assemblages chert usually predominates; consequently these, like quartzite, form resistant outcrops. Greenstones, particularly the talcose and serpentinized varieties, weather and abrade readily and are relatively soft;

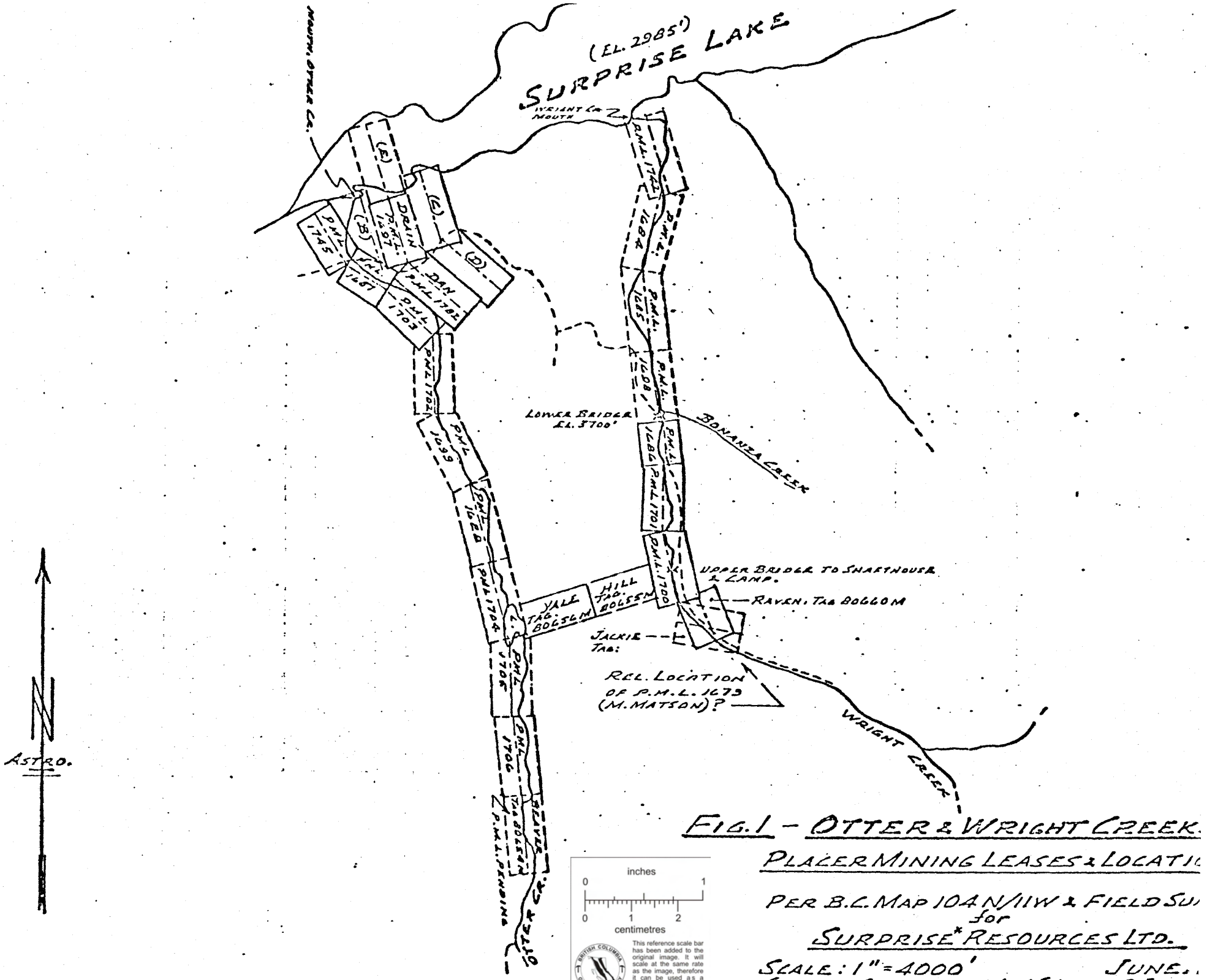

FIG. 1 – OTTER & WRIGHT CREEK.

PLACER MINING LEASES & LOCATIO

PER B.C. MAP 104 N/11W & FIELD SU

for

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SCALE: 1" = 4000' JUNE,

COMPIL. & SURVEYS BY W. M. SHARP, P. ENG.

consequently, they constitute the optimum type of bedrock for the development of 'pay-channels'.

Map 1082A shows that at least part of the lower sections of Wright and Otter Creeks are underlain by soft, talcose and serpentinized ultra basic intrusives. Consequently, pay-channels developed within these rocks should be deeper and wider, and the floors themselves should constitute more efficient gold traps, than they would within more resistant rocks.

B - SURFICIAL

The deposits are mainly fresh-appearing sandy, silty drifts with more or less clay binder; the cobble/boulder content is quite variable and the deposits may be massive or stratified. They are commonly intercalated with sandy/silty sediments of fluvioglacial (interglacial) origin.

The essentially unmodified nature of the continentally-glaciated land forms suggests that, essentially, all of the surficial deposits are of Wisconsin age. However, the rusty-weathered cemented deposits occurring at a few localities along Pine and Spruce Creeks contrast with the predominant fresh gray to buff-coloured drift. These are thought to be of pre-Wisconsin age, but deposited within the general Pleistocene period. It is also possible that a small part of the (Wisconsin) pay gravels derive from pre-existing Pleistocene, or even earlier (Tertiary) concentrations.

SECT. 1 - OTTER CREEK

GENERAL

Fig. 1 and Dwg. No. 0-1 supplement this section of the report.

Otter Creek flows northward into Surprise Lake, joining it approximately 1/2 mile from its west end. From Atlin, Otter Creek (bridge) is reached by 12.2 miles of good gravel road.

A narrow, locally steep dirt/gravel road departs from the Surprise Lake road closely west of the bridge and leads to the upper Otter Creek workings. Most of the up-stream section is only accessible via foot-travel; however, the latter is relatively easy in most areas.

Considering the latitude (close to 60°N) of the area, the climate is relatively moderate. In past years hydraulic mining was normally carried out between May 15th and October 15th.

Within the Atlin 'dry belt' the forest cover mainly comprises open stands of small lodgepole pine and spruce, with relatively light underbrush. Major swampy areas (water reservoirs) occur along the upper parts of creeks - particularly in the generally flat summit-headwater regions.

Most of the local mountains have been rounded by continental glaciation. Glacial drift covers all but local areas of bedrock right up to summit elevations, and thick deposits of boulder-clay till and intercalated fluvioglacial sand and silt occur within most of the modern drainage courses. Down-cutting by post-glacial (modern) creeks has left bank exposures of these deposits up to 150-feet high.

Otter Creek, including its upper west-flowing part, is about 9 miles long. In this distance it drops 1600 feet - an average gradient of 178 ft./mi. The present Otter Creek drainage area, or watershed, amounts to 16-1/2 sq.mi.; of this about 40% is drained by the upper west-flowing part of the creek.

HISTORY

Placer mining commenced on the upper part of the creek about 1899, and until 1903 was carried out via small-scale surface and underground methods. Within one early-worked interval of the creek the average yield of pay-gravels was about $1 per c.y. (1900 basis) from a pay-channel with 80' x 4' cross-sectional

dimensions. The writer estimates, from the very sketchy records available, that the 1906-11 production from upper Otter Creek amounted to 1560 oz. (reported) gold from 210,000 c.y. of overburden and gravel, of which it appears that approximately 54,000 c.y. comprised pay gravel. From this the following unit values are estimated:

Gold content (a) gravel ---------- approx. 60¢/c.y.
(b) overburden & gravel --- " 15¢/c.y.

With gold at $120 per ounce, the present-day equivalents of the above would be about (a) $3.60 per c.y., (b) 90¢ per c.y. Also, judging from even sketchier records, it appears that much of the overlying glacial drift yielded 4¢-8¢ per c.y. (gold at $20 per oz.).

On lower Otter Creek the old channel, east of the present channel, was profitably worked by underground methods. However, large-scale hydraulic operations in this section were never able to get down to the pay-horizon; hence were commercially unsuccessful. The sparse gold content of the general glacial overburden is indicated by the 1921 results. During that year some $10,000 in gold was derived from 200,000 c.y. of material moved - for a (1921) yield of 5¢ per c.y. (present value approx. 30¢ per c.y.).

The middle interval of the creek has not been mined, but has been drilled over a long period of years. It is reported that 21 holes were drilled (with a Keystone churn-drill) in 1921, and that all returned values wherever bedrock was reached. An average channel depth of 44 feet (reference?) was reported.

Drift mining being carried on in 1938 opened a 40' width of good pay-gravel below the layer of typically firm, silty hardpan; however, as the workings could not be held open because of squeezing ground conditions no significant production resulted.

Finally, drilling during 1950, on the east bank of the creek, at about 1 mile from Surprise Lake, found bedrock at a depth of about 140 ft. The writer estimates that this was done on the east bench at a location approximately across from sta. 6 of his upper traverse.

CLAIMS

Those originally staked, and recently staked or layed out for staking are shown on Fig. 1. To safely cover the projected, or tentatively-indicated trend of the old channel under the east bank of the creek it would be advisable to stake claims adjoining the east boundaries of P.M.L's 1702, 1699, 1688, and 1704.

FIELD WORK

June 4, arrive in Atlin and plan field work with T. Connolly.

June 5, on reconnaissance of Otter Creek, including random magnetometer tests; start control traverse.

June 6, continue traverse and topog. surveys.

June 7, continue surveys, with geological mapping; search for and tie in claim posts - noting errors in existing claim plots.

June 8, search out and tie in claim posts with T. Connolly; survey Drain Lease, with detailing; review claim situation with T. Connolly in evening.

June 9, (a.m.) with crew - establishing claim posts and location lines for protective-staking. (p.m.-Wright Cr.).

Dwg. No. 0-1, correlating the writer's surveys and the 100-scale detail, adequately covers the bottom end of the property. However, the important up-creek extensions of it could be covered more efficiently and economically via a smaller scale but adequately detailed (approx. 10' contour-interval) topographic map. A 1"=800' map derived from 1 in.=1/4 mi. air photography, if available, would provide excellent control for both the preliminary surveys and any follow-up exploratory and/or mining operations on Otter Creek.

LOCAL GEOLOGY (ref. Dwg. No. 0-1)

The drift cover is predominantly cobble/boulder-clay till with varied proportions of silty or sandy fines. The typically near-vertical slope of creek banks of this material, with faces locally over 100 feet in height, indicate the firm, coherent character of the material. Some sections of it are well stratified, while others are massive. In places the vertical section contains generally conformable, gently-dipping lensy layers of thin-bedded silty sediments; at other places it includes layers or lenses of silty to sandy cross-bedded outwash (delta-foreset) material.

Within one relatively short interval of the present Otter Creek (sta. 31 + 15 - 33 + 15) the mass of drift is underlain by fine open gravel, silty hardpan, and a basal layer of tighter (clay), somewhat rusty gravel. It is probable that this basal material comprises old, pay-channel gravels adjacent to the westerly (quartzite) rim of that channel. Section B-B on Dwg. No. 0-1 represents the surficial geology in this locality. Section C-C, close to B-B but incorporating drill intersections of bedrock to the east of the present creek, depicts the writer's preliminary interpretation of a wider cross-section - tentatively indicating the old channel. Section A-A depicts a typical section of till about the lower (lake) pit.

Over most of the lower Otter Creek area bedrock is not exposed. However, where it is well exposed along a 1700-foot interval of the creek it is predominantly massive to ribby-bedded quartzite and argillaceous quartzite. Only one relatively narrow panel of talc and serpentine-altered schist was seen within this section. If G.S.C. Map 1082A is correct the latter rock type should predominate within the one-mile interval of the creek upstream of the last outcrop observed by the writer. On the basis of the observed spatial relationships between the exposures of

basal gravels and quartzites noted above, the writer is inclined to interpret the latter as rim-rock comprising the west edge of the old pay-channel. If this is true, the main channel axis would situate in and under the east bank of the creek - possibly in a section of softer rocks abutting the panel of quartzitic rocks exposed within the above-noted 1700-foot interval.

PRELIMINARY APPRAISAL

Some aspects of the property which relate to its potential as a productive placer operation are:

1. The gold content of the placers derives from a significantly large source area of (eroded) mineralized bedrock.

2. Favourable conditions for placer-gold concentration occur over much of the 9-mile length of the creek.

3. A significantly large pay-channel is indicated - old reports noting a 200' x 40' cross-section within a lower central part of the creek, and an 80-foot width containing a 4-foot paystreak with a present value (Au @ $120/oz.) of $6 per cu.yd.

4. With the 1906-11 operations on upper Otter Creek giving a reported (2/3 of actual ?) yield of 1560 oz. of gold from 54,000 c.y. of gravel in 210,000 c.y. of overburden and gravel, the following present values are indicated:

   gravel ---------- $3.60 per c.y.
   overburden plus gravel ------ .90 per c.y.

5. The potential of the lower Otter Creek interval of the channel is partly indicated by the results of underground operations, which delineated a part-width of 40 feet of reportedly good pay gravel.

6. Large-scale hydraulic mining operations carried out over a long period of years on lower Otter Creek were financially

unsuccessful; however, they were, at the same time, physically unsuccessful in that they never reached down to the old channel indicated by concurrent and subsequent underground operations (and test-drilling?).

7. The sum of the current information indicates that mining operations on the lower and central parts of the creek might encounter waste-to-pay gravel ratios of 10 to 1, or slightly more or less. However, such an operation could be economically successful if pay gravels grading $5-$6 per c.y. were present, and mining and capital costs not in excess of those currently envisioned.

Following his serious consideration of all of the above aspects, the writer believes that the property warrants at least a limited programme of exploration, which could lead to a large-scale mechanical/hydraulic mining operation.

TECHNICAL CONSIDERATIONS

The following estimates are presented as a comparison of the relative stripping capacities of hydraulic and mechanical equipment.

(A) Hydraulic Equipment

May 25-Oct. 15, 1907 (100 10-hr. working days):

1 - No. 3 Giant on cutting down.

1 - No. 3 monitor for bank-water (by-water).

20,000 c.y. moved.

Stripping rate for 1 - No. 3 Giant = 200 c.y./day.

May-Oct. 1908, 30,000 c.y. moved.

Stripping rate for 1 - No. 3 Giant = 270 c.y./day.

May-Oct. 1908 - Lower Otter Creek.

Equipment, 2 - No. 4 Giants plus wash-monitors against 60'-100' banks.

Production - 112,000 c.y. moved in 100 days.

Stripping Rate per single No. 4 Giant = 560 c.y./day.

(B) Mechanical Equipment

(1) Bulldozers:

(Manufacturers performance data for ripping/stripping firm, coherent clay containing small boulders)

Basic, 200-foot passes and ripping 1/3 of cycle.

D-7, per 10-hour shift: gross, 700 c.y.; avg. net, 550 c.y.

D-8, " " " " gross, 850 c.y.; avg. net, 680 c.y.

(2) 2-1/2 c.y. Power Shovel: @ 50% of normal capacity in loose, clean material and 2 hours down-time = 1200 c.y./10-hr. day.

PRELIMINARY RECOMMENDATIONS

1. Complete survey (chainage) checks on existing claims.
2. Stake protective claims, where indicated by (1).
3. Carry out a geological reconnaissance examination and inspection of exposures and workings over at least the next 1-mile (up-stream) interval of Otter Creek.
4. Commence detailed delineation of the pay-channel, beginning at the up-stream end of the Drain Lease. Note that the reconnaissance phase of this project might be done adequately and economically by combining overburden-drill and geophysical (resistivity) profiling methods.
5. Sample indicated channel sections via (6") Keystone churn-drill.

SECT. 2 - WRIGHT CREEK

GENERAL

Figs. 1 and 2 supplement the following text.

Wright Creek, which generally parallels Otter Creek, joins Surprise Lake nearly 2 miles east of it. The first (lower) bridge on Wright Creek is reached via a 3-mile continuation of the road

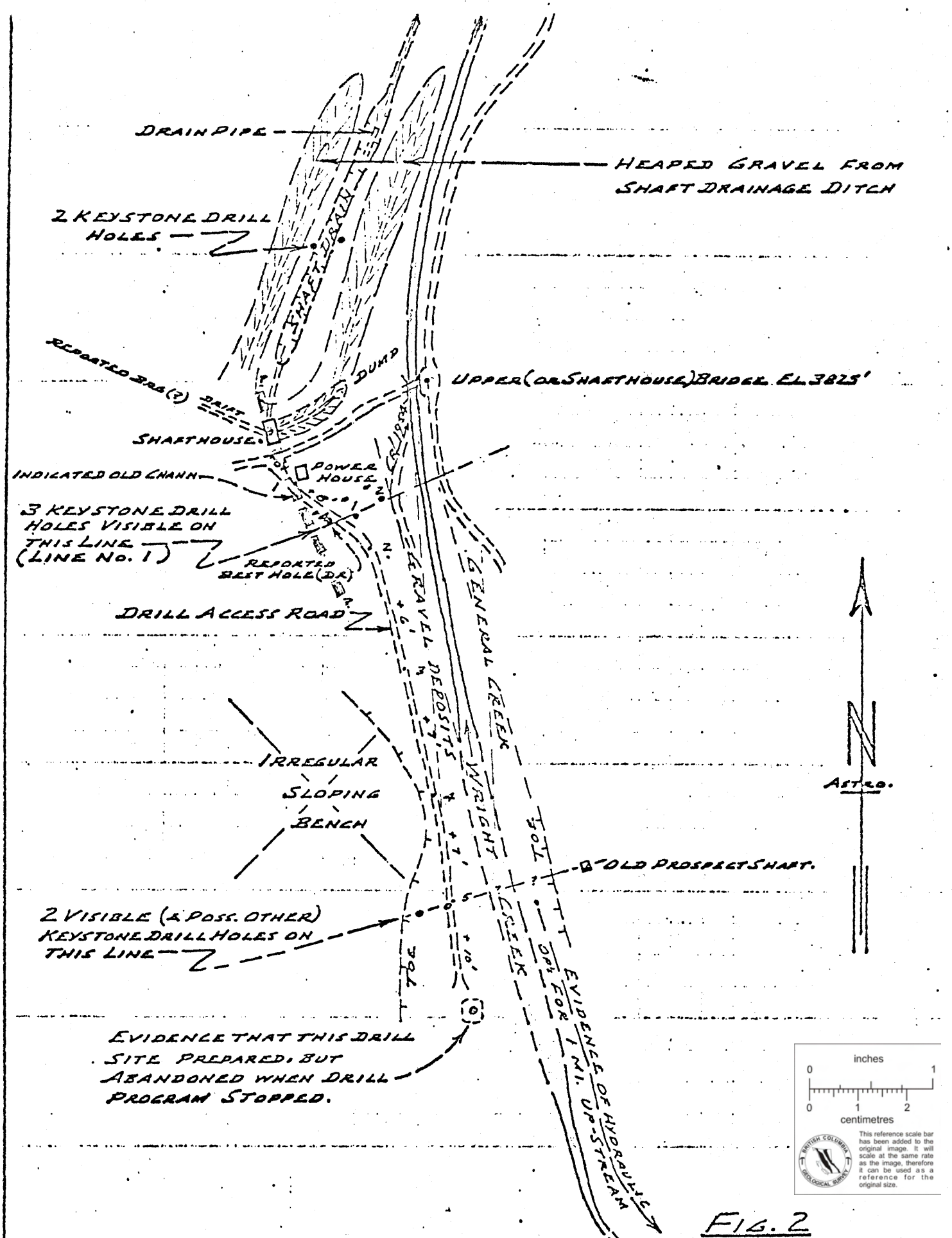


FIG. 2

SURPRISE RESOURCES LTD. - DRILL-HOLE & GENERAL DETAIL
WRIGHT CREEK, ATLIN, B.C.
SCALE 1 IN. = 200 FT. JUNE, 1973

beyond the Otter Creek bridge. The 1955 shaft and camp, adjacent to the No. 1 line of Keystone drill holes and situating about 1 mile south of the lower Wright Creek bridge, is 16 road-miles from Atlin.

The Wright Creek terrain, like that of Otter Creek, is flatly rounded - particularly within the headwaters area of the creek. However, the Wright Creek headwaters storage capacity is considerably smaller and less effective than that of Otter Creek and, as a consequence, its flow is smaller and more seasonal. Wright Creek, including its west-flowing branch, is only about 6 miles long; its 7 square-mile drainage area is less than half as large as that of Otter Creek. Within the following intervals average stream gradients are:

(a) Headwaters to shaft-camp bridge, 2.7 mi. @ 6.8%.

(b) Shaft-camp bridge to lower bridge (flats), 1 mi. @ 2.3%.

(c) Lower bridge to mouth (canyon section), 2.2 mi. @ 6.2%.

HISTORY

Wright Creek has been worked mainly along its upper section - along, and for a short interval below its westerly-flowing part. The broad, generally flatter valley section between the bend and the lower canyon has been explored by drill holes and a shaft in fairly recent years. First placer mining was by small-scale sluicing methods during brief spring-early summer run-off periods; existing reports contain little factual data on which the volume and tenor of the gravels worked might be estimated.

Between 1936(?) and the mid-1940's Hodges and partners carried out hydraulicking operations, using one or two small monitors. This mining was consistently hampered by a lack of water; after the spring run-off there was, reportedly, only enough for about four 1/2-hour runs per day. Some production data, from W.W. Johnson's Oct. 22, 1963 letter are:

1936-37, 16,000 c.y. yielded $13,759 (485 oz. gold), or 86¢/c.y.

1938 , 13,800 c.y. yielded $32,715 (1154 oz.), or $2.36/c.y.

The latter grade, at the present $120/oz., would be approximately $8/c.y.

During 1951-52 the pay channel, at about 170 ft. south (up-stream) of the present shaft-house, was explored by 3 (plus one abandoned) holes comprising Line No. 1 (Fig. 2). Two of these penetrated pay-gravel and bedrock forming the west brow and side, respectively, of the channel; the third was stopped in gravel - possibly at 4'-6' above the bedrock floor(?). Holes are on approximately 40-foot E-W centers. The drill logs indicate that bedrock, at least locally, is black slate. The drill-indicated depth of the old channel is about 18 or 20 feet, and the indicated average thickness of pay gravel is about 13 feet - including the near-rim intersection. The weighted-average grade (1954) of the 3 intersections is $12.64 per c.y.; the grade, on $120/oz. gold, is about $43 per c.y. The average and individual grades of these intersections is from 5 to 8 times larger than the grade of the best previously-reported production; hence, it is highly unlikely that they are representative of pay gravels underlying this general interval of the creek.

In 1952 six holes were drilled on an indicated 800-foot wide, and relatively flat cross-section of the valley. However, the writer was unable to find any evidence of them during his recent visit. Subsequent re-examination of the available data suggests that the line of holes may locate 1800 feet below the lower, rather than the upper bridge. This possibility is based on map and field indications of the valley topography and bedrock depths. As all holes encountered bedrock (per photocopy) at depths between 11-19.5 feet, it is hardly likely that they were collared anywhere on the drift and alluvium-covered flat between the bridges or, specifically, on a line 1800 feet down-stream of the upper bridge.

Also, there was no evidence of even the former existence of requisite drill-access roads leading to this location. The writer now concludes that the most logical place to investigate is an indicated 'flat' cross-section of the valley at about 1/2 mile north of the lower bridge.

During 1956 the existing shaft was sunk to a probable depth of about 110 feet. In view of the bedrock depths indicated by the Line No. 1 drill holes, it is unlikely that it reached the 'reported' depth of 136 feet. From the shaft bottom a drift was driven (in gravel?) for 180 ft. northwest, reportedly to explore the west rim, when the obvious target would have been the pay-gravels intersected by the up-stream line of drill holes - particularly those intersected by Hole No. 4. In 1957 a drift being driven towards Line No. 1 was stopped after an advance of 40 feet - apparently because of a pump failure.

CLAIMS

The writer and T. Connolly check-chained the location lines of P.M.L's 1686, 1701, and 1700; T.O. and S.J. Connolly checked-chained the claims south of the latter while the writer was engaged in other surveys. The actual position and length of the above-noted claims is shown on Fig. 1. However, claims north of P.M.L. 1686 have yet to be checked; it is expected that this will lead to some revisions of the 'official' claim plots.

FIELDWORK

June 9, p.m. - Preliminary reconnaissance; locate shaft-house on Map 104N/11-W 1/2; run chain-line for 2000 feet north (d/s) of upper bridge.

June 10 - Check-chaining claims; search out and survey old Keystone churn drill-hole collars; search for Line No. 2 drill-hole collars and/or evidence of old drilling operations.

GEOLOGY

Up-stream of the upper bridge the valley is continuously drift-filled and largely blanketed with tailings (boulders, gravel, sand) from former mining operations. Between bridges, the valley expands from about 200-300 ft. to roughly 700 feet in width, and appears to be floored by 100 or more feet of glacial till; this flat, poorly-drained area is superficially covered by tailings and natural alluvium.

Other examination priorities precluded personal inspections of the few, out-of-the way bedrock exposures. However, G.S.C. Map 1082A shows soft, talc-altered ultrabasic rocks underlying Wright Creek from about 300-3000 feet north of the lower bridge - which probably explains the local increase of the creek-gradient and down-cutting in this locality. The G.S.C. map also indicates that the up-stream parts of the valley are underlain by cherty and argillaceous rocks of the regional Cache Creek Group. Bedrock penetrated by the Line No. 1 drill holes is logged as black slate. More probably, however, it consists of the typically shaly argillite and argillaceous quartzite of the general locality which, if striking across the trend of Wright Creek as is suggested by the G.S.C. mapping, might be reflected in the long profile (hump and hollow?) of the floor of the buried pay-channel.

PRELIMINARY APPRAISAL

The mile-long, 400-700 foot-wide flat area between bridges is apparently underlain, surficially, by a thick blanket of the typical local clay/silt/sand till. That this is probably water-saturated is evidenced by the flat, locally swampy cover and sinuous, braided stream pattern. Therefore, even surface mining (mechanical or hydraulic) in this area might be difficult and costly. Such an operation would probably entail relocation and deepening of the creek channel, and continuous unwatering (via sumps, pumps, etc.) of the working area. These and other factors could restrict operations and increase mining costs to levels perhaps not

justified by the existing reserves (?) of pay-gravel. The writer's revised estimates of the potential profitability of mining a 1400-foot length of pay gravel in this locality are based on a hopefully-realistic extrapolation of the figures provided by the Line No. 1 drilling, and on the difficulty of mining in water-saturated ground. Values previously on $35 per oz. gold base are transposed to the current $120 per oz. base:

Preliminary Estimates:

(a) Based on uncut 1954 drill-hole sample data:

Gross Recovery, 45,000 c.y. @ $23.46		$1,056,000.
Stripping, 515,000 c.y. @ 0.50	$257,500.	
Mining, 45,000 c.y. @ 1.00	45,000.	
Washing, 45,000 c.y. @ 0.25	11,250.	
Royalty, etc.	53,000.	366,750.
Gross Profit		$ 689,250.
Dam construct., 18,000 c.y. @ 0.50	$ 9,000.	
Bridges and light structures	4,000.	
Install washing/waste disposal facilities	40,000.	
Roads	2,000.	
Financing, interest, overhead	20,000.	
Contingencies (mainly operational)	25,000.	100,000.
Net Profit		$ 589,250.

(b) Based on cut drill-hole assays:
The average of these is cut to a level equal to twice the current value of the 1938 production:

Gross Recovery, 45,000 c.y. @ $16		$ 720,000.
Pit-preparation & mining costs	$366,750.	
Plant installation cost, etc.	100,000.	466,750.
Net Profit		$ 253,250.

(c) Based on tentative break-even grade:

Gross Recovery, 45,000 c.y. @ $11		$ 495,000.
Pit-preparation & mining costs	$366,750.	
Plant installation cost, etc.	100,000.	466,750.
Net (residual) Profit		$ 28,250.

PRELIMINARY RECOMMENDATIONS

(1) Complete check (chain) survey of claims.

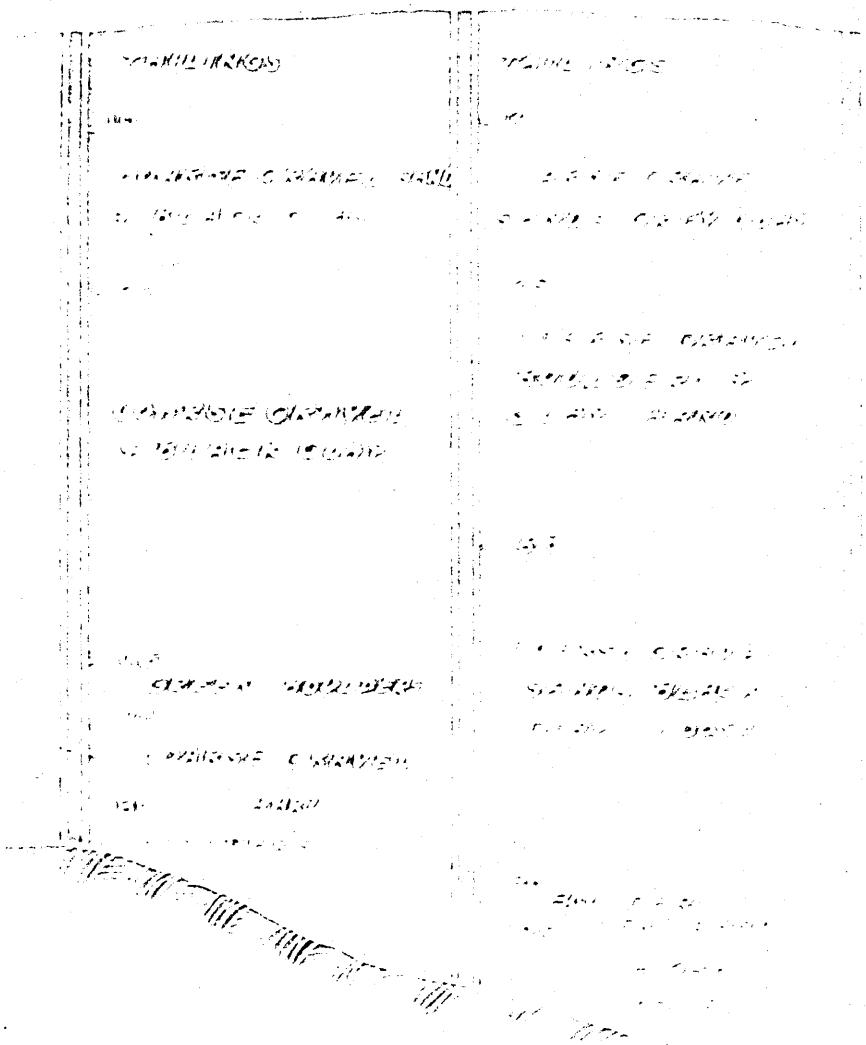
(2) Complete reconnaissance investigation of property.

(3) Delineate pay-channel over 1400' length in vicinity of 1956 shaft:

Suggest use of overburden drill in conjunction with geophysical (resistivity) profiling on cross-lines 200 ft. apart.

(4) Sample (and check-sample vic. Line No. 1) indicated channel via (6" dia.) Keystone churn-drill or equivalent equipment.

(5) Pending results of above, investigate water content and permeability of glacial and alluvial deposits overlying pay-gravels - re. subsequent detailed feasibility studies.



SECT. 3 - SPRUCE CREEK

GENERAL

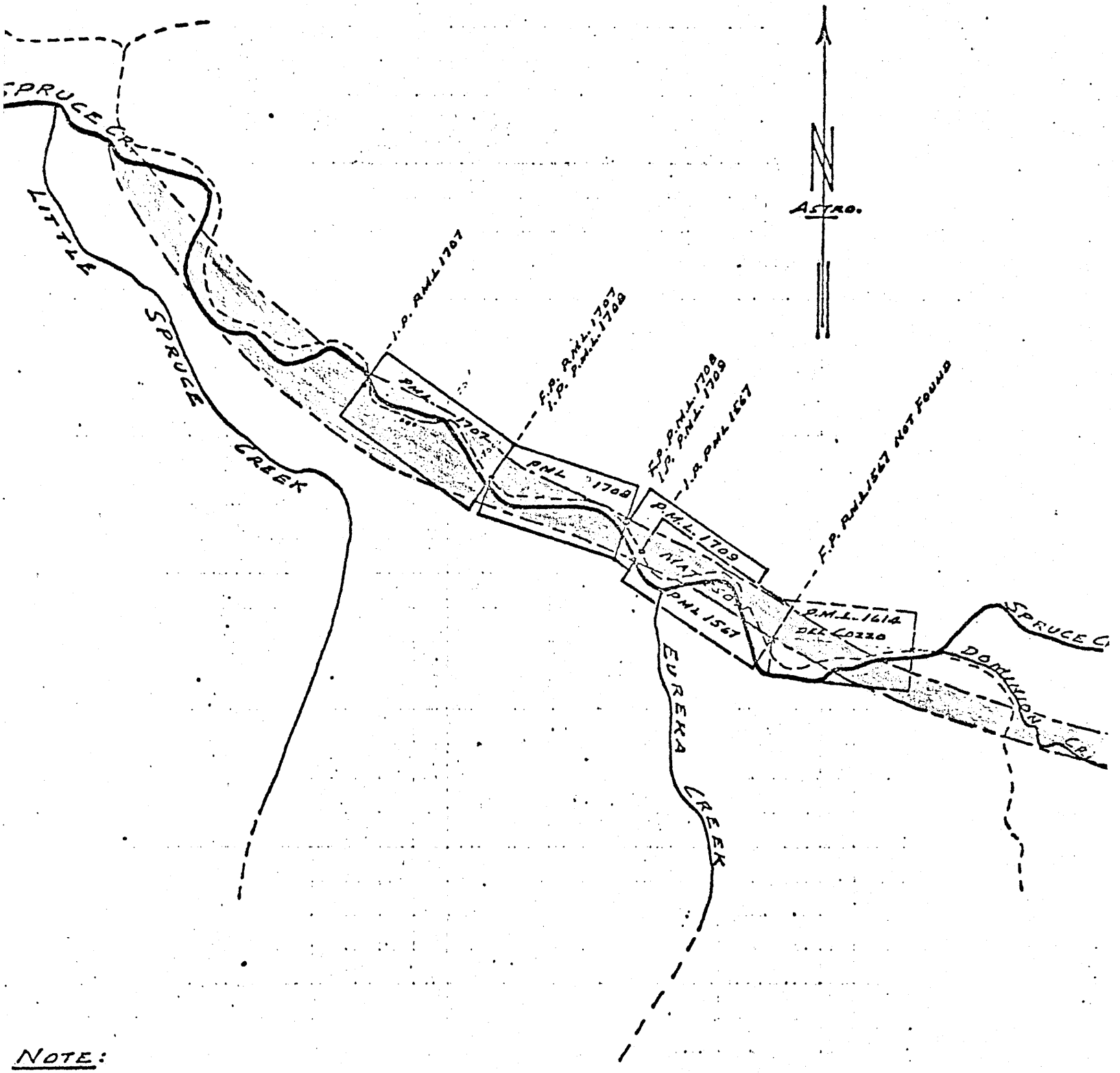
Figs 3 and 3A supplement the following text.

From Atlin, the leases on lower Spruce Creek are readily accessible via 7 miles of good road.

Fig. 3 is a plot of P.M.L's 1707,-08,-09 and the up-stream contiguous claims according to the writer's check-survey. Fig. 3A portrays the general group of claims covering lower Spruce Creek, and including those on Fig. 3, according to B.C. Dept. of Mines maps. The position of the old buried channel (per map - Rept. to Min. of Mines, 1936) is shown on both.

FIELDWORK

This was done on June 12, 1973 and comprised a chainage check, using the mouth of Eureka Creek as the local topographic reference point, of P.M.L. 1707,-08,-09 initial and final posts and the initial post of Mattson's P.M.L. 1567; the final post of the latter



NOTE:

PROJECTED COURSE OF BURIED OLD CHANNEL.

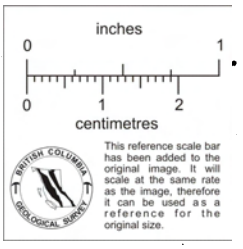


FIG. 3

SPRUCE CREEK P.M.L's.

PER FIELD CHECK-CHAIN SURVEY

SCALE: 1 IN. = 2170 FT. JUNE, 1973

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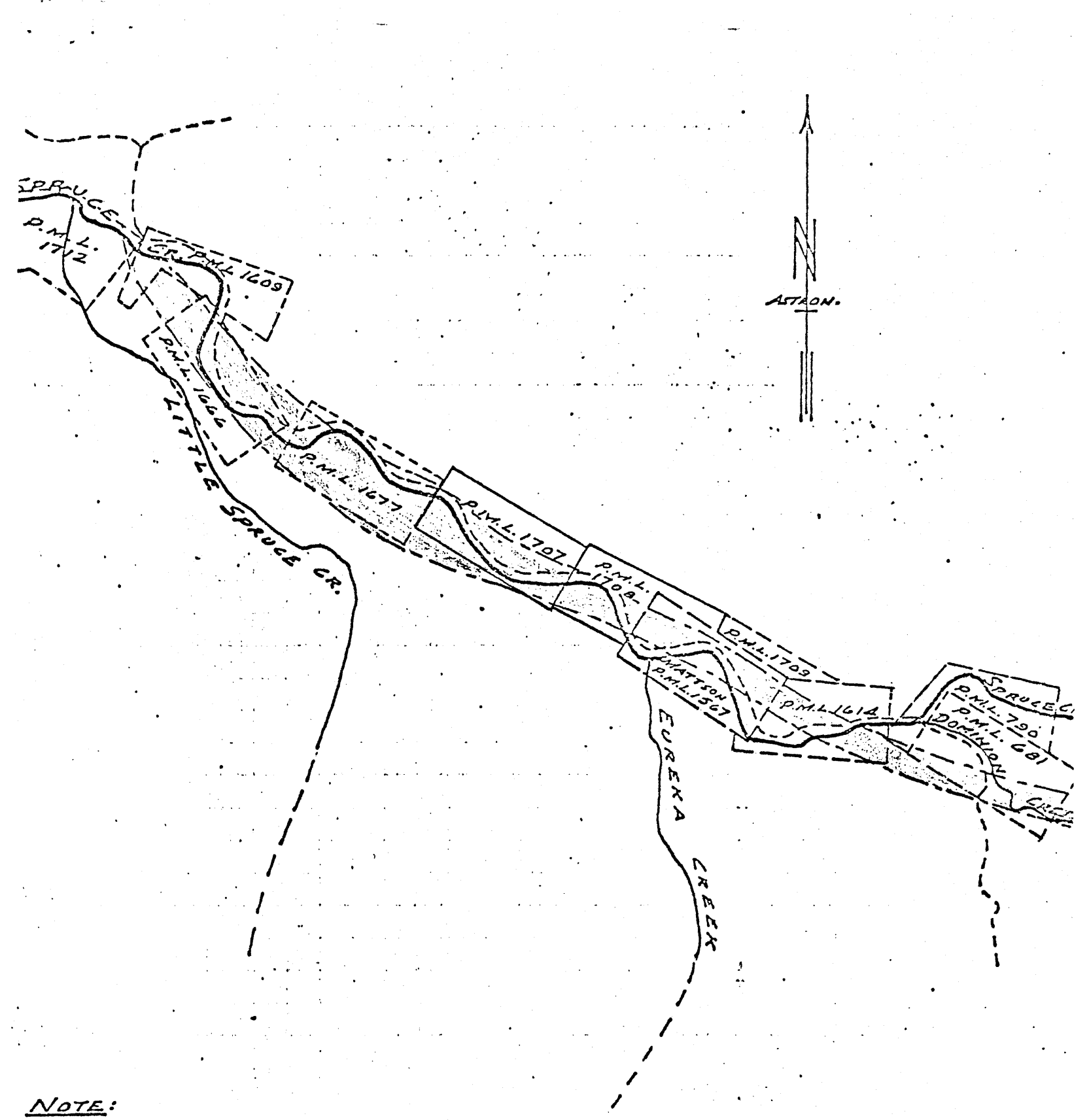

NOTE:

PROJECTED COURSE OF BURIED OLD CHANNEL.

inches
0 1
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centimetres

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

BRITISH COLUMBIA GEOLOGICAL SURVEY

FIG. 3A

SPRUCE CREEK P.M.L's.

PER B.C. DEPT. OF MINES MAP 104 N/1

SCALE: 1 IN. = 2170 FT. JUNE, 19

for

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GEOL. REF: REPT. OF MIN. OF MINES, 195

W.M. SNARR, P. ENG.

could not be located. The main characteristics of the local glacial deposits were noted but not mapped.

HISTORY & PRINCIPAL FEATURES

Spruce Creek has a total length of about 15 miles. It drains a major area which is extensively underlain by rocks of the "Gold Series" and overlain by thick deposits of (mainly Wisconsin) glacial till and alluvial deposits; the latter range from about 50-250 feet in thickness below the present level of the creek or lower benches.

The buried pay-channel has been closely explored and/or mined over a length of about 3-1/4 mi. A further 5-mile, up-stream stretch of potential pay-channel is indicated (1936). The indicated range in width of pay gravel is 600'-1200' down-stream of Dominion Creek, and narrowing to 375 ft. up-stream of it. Over its length, the pay-channel was explored and mined via surface and/or underground methods. However, it seems probable that only a minor part of its gross potential has been exploited to date, by reason of physical and economic limitations.

Old 'drift' exposures of the pay-channel show that the soft-altered or weathered bedrock is overlain by 6' to 10' of sticky, clay-cemented gravel containing boulders up to 30" in diameter. Gold values varied from about 1/2 oz. to 20 oz. per 40 sq.ft. (loc.11 c.y.?) of gravel/bedrock section, including gold in bedrock.

PRELIMINARY APPRAISAL

P.M.L's 1707,-08,-09 include a one-mile length of the indicated pay-channel, and about 90% of its projected area within this interval of Spruce Creek. Only one determination of relative surface/bedrock elevations within this interval is given by the 1936 M.M. Report map - this indicating bedrock at a depth of only 35 feet near the down-stream end of P.M.L. 1708. It indicates a

60-foot bedrock depth at a point (within the Mattson P.M.L. 1567) situating about 1150 up-stream of the west end of P.M.L. 1708. The foregoing suggests that pay-channel bedrock depths over the P.M.L. 1707-08-09 interval of the creek are about 40 ft. to 70 ft., going up-stream.

Reports studied by the writer contain little information from which even approximate estimates of grade might be made. However, it appears that several of the former mining operations on Spruce Creek were profitable. More locally, it is fairly evident that the (1934-36-?) steam-shovel operation, on ground that would now situate near the boundary of P.M.L's 1707-08, was profitable at the $35/oz. level; therefore, a similar type of operation at current price-levels should be profitable on equivalent or lower grade material. Between the banks of Spruce Creek, and allowing space for its diversion, a 200-foot wide strip of pay gravel plus bedrock should be minable by power shovel. Over the length of P.M.L. 1707-08-09, and further assuming an average 10-foot pay-layer, this would contain gross minable reserves of $\frac{5400 \times 200 \times 10}{27}$ equals 400,000 c.y.

The total minable remaining reserves would probably be in excess of 200,000 c.y.

In view of the number of 'unknowns' involved, the writer is unable to offer a valid opinion concerning the feasibility of a mining operation in this locality, or even if one should be contemplated - in view of the prospects existing on Otter and Wright Creeks.

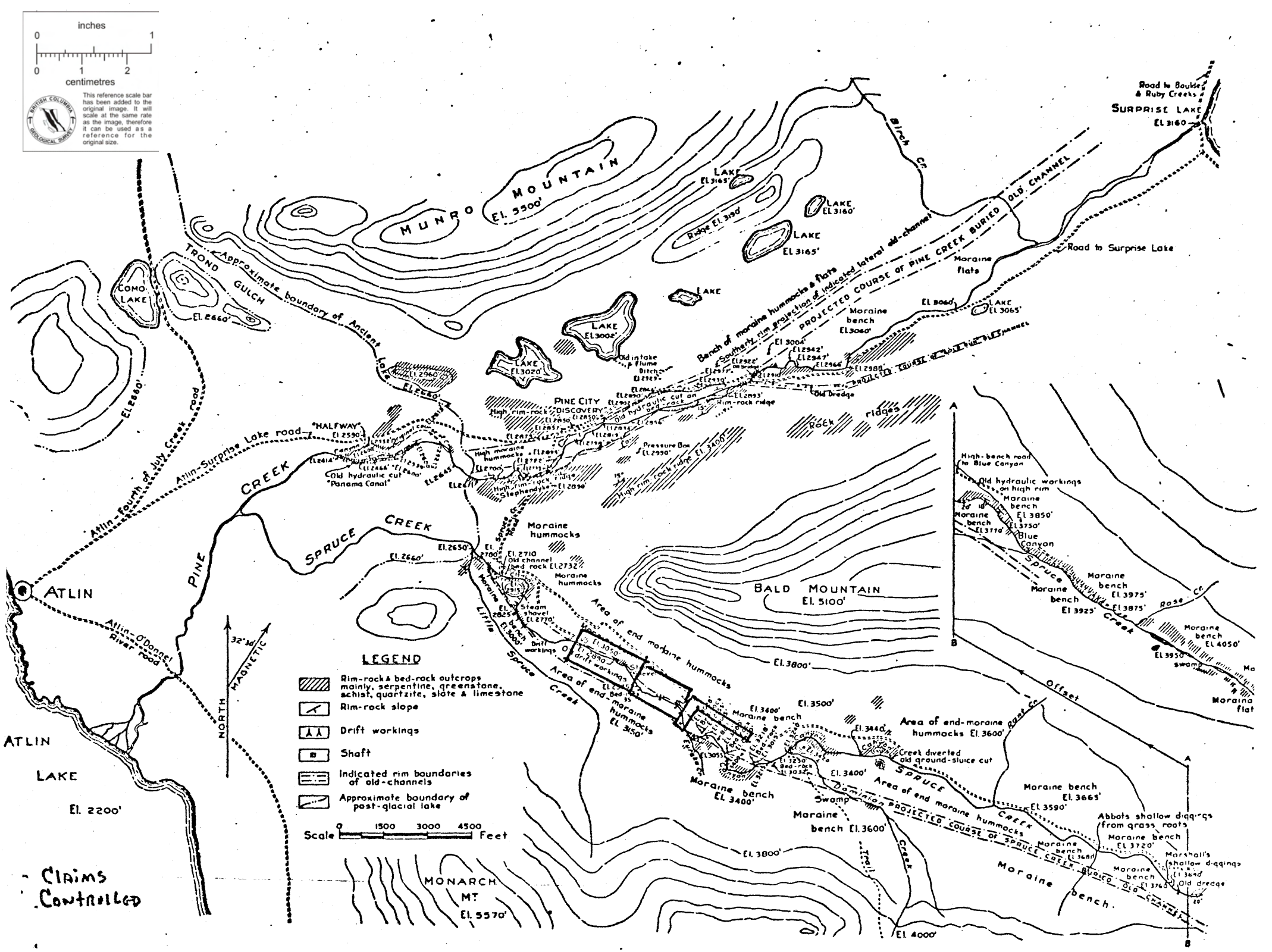
PRELIMINARY RECOMMENDATIONS

(1) Attempt to acquire P.M.L's 1666 and 1667 for provisional down-stream access and tailings disposal - depending on current probability of acquiring P.M.L's 1707-08-09 on favourable terms.

(2) Map existing workings, general topography, and pertinent geological detail, via a compass-chain traverse, within P.M.L's 1707-08-09 and part of down-stream area.

(3) Continue field investigations (incl. Atlin 'sources') pertaining to former exploratory and mining operations on Spruce Creek.

(4) Evaluate prospects on basis of the data resulting from (2) and (3) above.



FINE CREEK AND SPRUCE CREEK, ATLIN. PLAN SHOWING PLACER-GOLD AREAS.

SECT. 4 - LUCKY GOLD-SILVER PROSPECT

GENERAL

Fig. 4 supplements the following text.

The writer mapped and sampled the Lucky surface showings on June 11, 1973. Older workings, comprising a shallow shaft and a 50-60 foot adit, were inaccessible.

CLAIMS

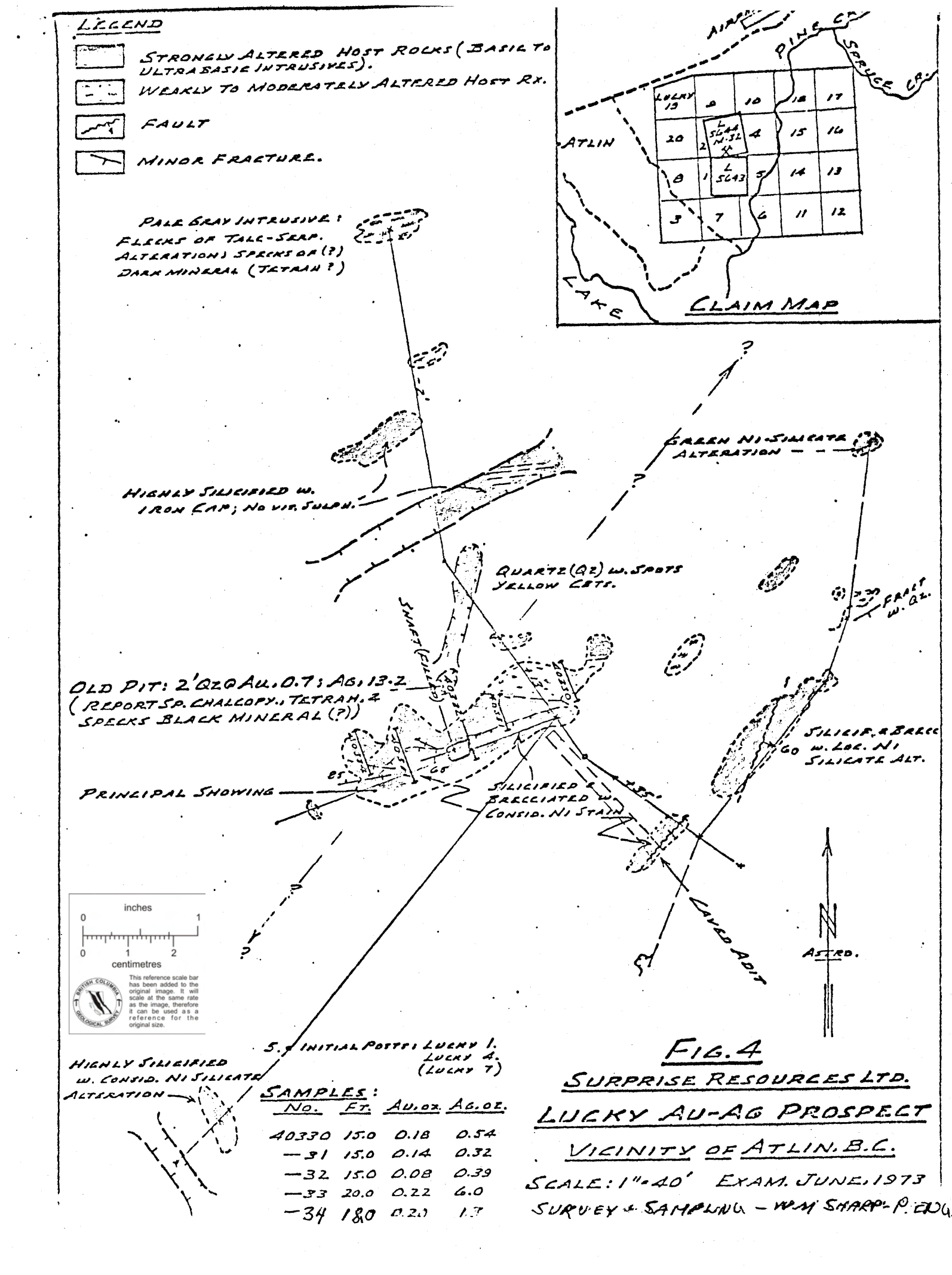
These consist of 2 Crown-granted and 20 located claims. The present 22-claim group of contiguous Crown-grants and locations comprise a 1 by 1-1/2 mile block.

The Pictou (L5643) and Scarab (L5644), originally located in 1933, were acquired on September 27, 1966 by T.O. Connolly via M.L. No. 32. Lucky 1-20, Rec. No's 8500N-8519N inclusive, were staked by S.J. and T.O. Connolly in October, 1967. The owners state that all claims are in good standing.

The showings examined by the writer reportedly situate on the Pictou claim; they lie within a 250 by 300 foot area.

LOCATION & ACCESS

The Pictou/Scarab claims lie about one mile east (approx.) of Atlin, B.C. The showings are easily accessible by way of some



SAMPLES:

No.	Ft.	Au. oz.	Ag. oz.
40330	15.0	0.18	0.54
—31	15.0	0.14	0.32
—32	15.0	0.08	0.39
—33	20.0	0.22	6.0
—34	18.0	0.20	1.7

FIG. 4

SURPRISE RESOURCES LTD.

LUCKY AU-AG PROSPECT

VICINITY OF ATLIN, B.C.

SCALE: 1" = 40' EXAM. JUNE, 1973

SURVEY & SAMPLING — WM SHARP - P. ENG.

2 miles of good gravel road. Locally, the showings lie along the east slope and crest of a low (N.E. trending) ridge rising out the Pine Creek flats - the latter consisting of thick valley-floor deposits of drift and alluvium. In elevation, the showings and natural exposures of bedrock range from 5-50 feet above the flat ground.

The claims area, which is low, lightly forested, and with very little underbrush, is ideally situated for rapid, surface exploration.

HISTORY

1899, Prospected by open-cutting; no sample records.

(1925-30?), Prospected by open cuts, short tunnel, and shallow shaft.

1931, Inspected by J.T. Mandy (reliable), Resident Mining Engineer:
(a) Zone of quartz-veining and wall-rock alteration over widths of 20-60 feet.
(b) Ridge-pit sample - 2' quartz @ Au, 0.7 oz/ton; Ag, 13.2oz/ton
" " dump - grab @ Au, 0.68 oz/ton; Ag, 7.4 oz/ton.
Bottom of shaft - 9" quartz @ Au, 0.03 oz/ton; Ag, 0.20oz/ton

1933, Inspected by A.M. Richmond (reliable), Asst. Res. Min. Eng.:
(a) Ridge-pit sample - 22" quartz @ Au, 0.10 oz/ton; Ag, 0.40 oz/ton.
Ridge-pit sample - 24" quartz @ Au, 0.60 oz/ton; Ag. 5.0 oz/ton.
(b) During year Picton and Scarab claims located.

1966, (a) T.O. Connolly obtained M.L. No. 32; blasting done near old shaft; samples - Au, 1.78 oz/ton; Ag, 135.6 oz/ton; Cu, 0.63%; - Au, 2.16 oz/ton; Ag, 207.3 oz/ton.

1967, (a) Rock excavation by T.O. Connolly, and bulk sample of mineralized material sent to Trail, returning assay incl. Au, 0.295 oz/ton; Ag, 8.0 oz/ton; Pb, 0.2%, Zn, 0.1%, Cu, 0.05%.

1968, Bulldozer-clearing & ripping, with vein exposed on either side of the shaft for 60 feet; "random samples" ran:

No.	Au,oz/ton	Ag,oz/ton	Cu,%
A#2	1.40	57.4	0.39
B#2	1.54	78.3	0.42
#2R	1.52	52.3	0.27

GEOLOGY & MINERALIZATION

G.S.C. Map 1082A shows the Atlin-lower Pine Creek area (down-stream of mouth of Spruce Creek) to be entirely underlain by Atlin ultrabasic intrusive rock, comprising peridotite, meta-diorite and metagabbro. In the vicinity of the Lucky showings these have been sheared, brecciated, hydrothermally-altered, and mineralized. The alteration is characterized by a rather pervasive silicification - including distinct quartz-veining - and spotty carbonatization. The most distinctive alteration mineral is a nickel-chrome silicate, which imparts a bright green mottled aspect to locally-extensive areas of grey and brown rock. It is most conspicuous in well fractured/brecciated areas of general siliceous alteration and is at least spatially related to the local metallic mineralization.

The local gold-silver/Cu-Pb-Zn sulphide mineralization is dispersed within quartz veins and the enclosing altered wall rocks. To date its trend and extent have not been established. If it is fracture-controlled, its trend may be indicated by local, northeasterly-striking shears and fractures.

CURRENT SAMPLING

In view of the apparent generally-diffused character of the mineralization, the writer elected to sample for 'bulk-potential'. This was done via five long chip-channel samples, taken at intervals across(?) the largest, well mineralized exposure. The samples were not taken at uniform 'strike-intervals', but where the best cross-sectional continuity of exposures and mineralization

was indicated. These (Fig. 4) returned the following assays:

Sample No.	Sample-type	Length, ft.	Au, oz/ton	Ag, oz/ton
40330	contin-chip	15.0	0.18	0.54
40331	"	15.0	0.14	0.32
40332	"	15.0	0.08	0.39
40333	"	20.0	0.22	6.0
40334	"	18.0	0.20	1.3
Weighted-Average		16.6	0.169	1.95

The writer considers that the above is a 'conservative-average' grade in that an apparently well mineralized section at the southwest corner of the sample area, that had been generally buried during the earlier stripping operations, was excluded. Allowing for this, the gold-silver values would appear to correspond reasonably well with those obtained from the T.O.C. bulk sample shipped to Trail in 1967. Hence, a gross value of upward of $25 per ton (gold @ $120, silver @ $2.60) is indicated for the 80' x 20' area sampled.

SUMMARY & RECOMMENDATIONS

Mineralization with a gross value of $25 per ton over an approximate 80' x 20' area is indicated by the recent sampling. The writer would expect that at least 90% of the contained gold and silver, plus associated Cu-Pb-Zn sulphides, might be extracted by conventional milling methods, and resulting in a net value of $22.50 plus per ton. To constitute ore, this material would have to occur over a considerably larger (possibly 10X) surface area, with comparable persistence to depth.

To date, exploration and/or sampling have been confined to a small area around the shaft. Consequently, this should be extended by appropriate methods - initially via the stages suggested below:

(1) Chip-sample remaining exposures; assay as indicated.

(2) Geochemical soil and rock-sampling:

(a) Local profiling and possible trend-delineation over the general area of showings via sampling on a 50' x 50' grid plan.

(b) Prospecting and general delineation outward of general area of showings via sampling on a 100' x 100' grid plan.

(3) Carry out systematic surface stripping and sampling of bedrock mineralization on a 25' x 25' to 50' x 50' grid plan over the current showings - preferably by short (pack-sack) drill cores.

(4) Diamond drill dip-extensions of specific zones indicated by results of (1) and (2).

SECT. 5 - IMPERIAL GOLD-SILVER PROSPECT

GENERAL

Details of the local geology and sampling are shown on Fig. 5.

The surface showings were mapped and sampled on June 11, 1973; both adits were inaccessible.

CLAIMS

Fifteen contiguous Crown-granted claims plus recent locations to cover lateral extensions of the vein comprise the present group (record no's pending).

The basic block of Crown-grants consists of the Imperial group of 4, the Kitchener group of 3, the Aerial group of 4, and the Nanaimo group of 4 claims.

LOCATION & ACCESS

The claim groups and showings situate on the southwest slope of Mt. Munro; the adit showings lie at about 4 air-miles northeast of Atlin, at roughly 1000 feet above the valley flats. The

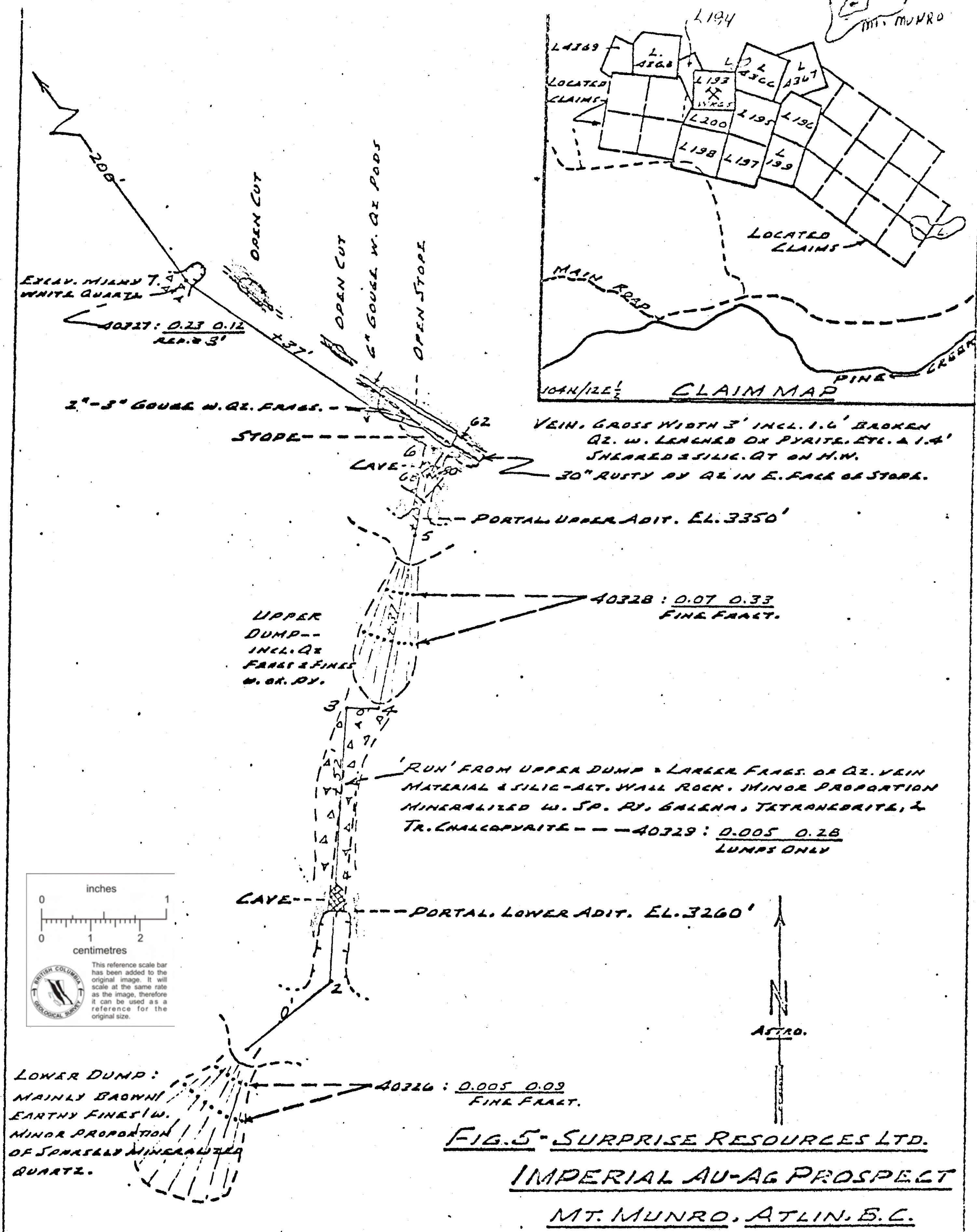


FIG. 5 - SURPRISE RESOURCES LTD.

IMPERIAL AU-AG PROSPECT

MT. MUNRO. ATLIN. B.C.

SCALE: 1" = 40' EXAM. JUNE, 1973

SURVEY & SAMPLING - W.M. SHARP. P.ENG.

" ASSISTANCE - T.O. CONNOLLY

ASSAYS REPORTED : AU : AG OZ/TON PER GRAB SAMPLE

The property is easily accessible via the Pine Creek road and Imperial trail. The workings are judged to be on Lot 193.

HISTORY

The first claims (Imperial Group) were located in 1899, and bonded to the Nimrod Syndicate of London, England in 1900. This company built a 5-stamp mill, did considerable underground development, and mined a few hundred tons of ore before relinquishing their bond. In 1902 it was optioned by Herbert Pearse, but no significant work was undertaken.

The group was recently acquired by T.O/S.J. Connolly of Atlin.

VEIN AND WORKINGS

The vein, locally consisting of two to three closely parallel quartz veins, strikes N50-65°W and dips 50-65° S.W. It varies from 5 inches to over 6 feet wide, averaging about 2.5-3.0 feet. Mineralization consists of sparsely disseminated pyrite, galena, chalcopyrite, oxidation products of these and, locally, some free gold. Much of the small shoot mined from the upper adit graded about $10 per ton (Au @ $20.67/oz.).

Old workings comprise an upper and lower adit, respectively driven 25 ft. and 112 ft. to intersect the vein; thence 170 and 135 feet on the vein - mainly to the southeast.

GEOLOGY

G.S.C. Map 1082 indicates that the workings lie within Atlin meta-diorites and gabbros near their contact with Cache Creek greenstone and greywacke. However, the writer identifies the local wall rocks as massive to faintly-bedded quartzites - possibly of the Cache Creek Group. At the upper portal these (hanging wall) beds strike about N60°W and dip 68°N.E. - towards the vein.

The quartz vein can be traced from old pits, for at least 250 feet northwest of the upper adit (stope).

MINERALIZATION

Old sampling and geological reports indicate an average 0.8 oz. ton gold within a 20 inch by 35 foot section of the vein where intersected by the upper adit cross-cut. The vein interval exposed in the lower adit was essentially barren; however, A.M. Richmond (1933) notes that drifting on the lower level was away from (S.E. of) the projected plunge of the small oreshoot opened by the upper adit.

The writer took one sample of vein fines from the lower dump, one of similar material from the upper dump, one of coarse fragments of vein material from the upper adit, and one of apparently barren white quartz from an open pit at 100 ft. N.W. of the upper portal. None revealed anything of commercial importance.

CONCLUSIONS & RECOMMENDATIONS

The amount of exploratory work and sampling done to date does not provide a sufficient base for even a qualitative assessment of the gross ore potential of the vein. In view of the fact that good grade Au-Ag mineralization has been locally exposed on a strong, possibly long quartz vein, the writer feels that it warrants at least a small programme of surface stripping or cross-trenching and sampling. This could be carried out in about two days by a small bulldozer. The N.W. strike-extension of the vein appears to furnish the most attractive target.

W.M. Sharp, P.Eng.

Abstract from:

REPORT OF THE MINISTER OF MINES, B.C., 1936
NORTH-WESTERN DISTRICT (No. 1)
pp. B39-56

PLACER-GOLD DEPOSITS.

Atlin Area.

Field-work in the Atlin section during the 1936 season had as its main objective the detailed study of Pine and Spruce Creeks for the purpose of outlining the old channels and establishing their continuity and location.

The Atlin placer-gold area is situated in the north-west corner of the Province, in the Atlin Mining Division. It is located between latitude 59 degrees and 60 degrees north and longitude 133 degrees and 134 degrees west. Atlin Lake occupies a deep north-south trough along the west side of this quadrant. The lake is 65 miles long and varies from 1½ miles wide at its north end to 6½ miles wide in the south part, where the West Channel, also constituting a long, narrow, branching waterway, is 25 miles long and about 1¼ miles wide. The north end of Atlin Lake extends across the 60th parallel of latitude for 2 miles into Yukon Territory. The town of Atlin is located on the east shore of Atlin Lake, 30 miles south of the Yukon boundary.

The area is reached by regular and frequent steamship service from Prince Rupert, Vancouver, and United States Pacific ports to Skagway Alaska, a distance of about 420 miles north-westerly from Prince Rupert and about 1,085 miles north-westerly from Vancouver. From Skagway a regular service is supplied by the White Pass and Yukon Railway to Whitehorse. From the town of Carcross, Y.T., 55 miles north-easterly of Skagway on this line, steamers are operated during the summer by the White Pass Company on Tagish Lake to Taku Landing, about 71 miles south-east of Carcross. At Taku Landing a transfer is made via 2½ miles of railway to Scotia Bay on Atlin Lake, which is crossed by boat to Atlin. Summer freight-rates on commodities from Prince Rupert, Vancouver, and Victoria to Atlin vary from $51 to $66 a ton for car-load lots. The rates for machinery to Atlin are $51 a ton for car-load lots and $56 a ton for less than car-load lots. Generally, the rate for less than car-load lots varies from $74 to $103 a ton. For ore in sacks, not exceeding a value of $100 a ton, the rates from Atlin are $8.25 a ton for car-load lots and $9.25 a ton for less than car-load lots. In winter months Atlin is accessible either by aeroplane from Juneau, Alaska, or Carcross, or by dog and horse teams.

Development of the Atlin area has been handicapped by this roundabout but unavoidable means of access, attended by high transportation costs. To facilitate access to the area by aeroplane the Dominion Government established a Canadian Customs office at Atlin during the 1936 season.

History.—Before 1898 very little was known of the Atlin country beyond the fact that it contained fur, big game, and a number of large lakes, the largest of which was called "Atlin," meaning "Big Water," by the Tlinkit-Tagish Indians. According to the most authentic sources, gold was first discovered on Pine Creek about July, 1897, by a man named Miller when driving cattle into Dawson. The information, together with a rough map, was passed on to Miller's brother, Fritz, in Juneau, who together with Kenny McLaren, a Canadian prospector, Hans Gunderson, and another, were on their way to the Klondike. These men decided to investigate and with the aid of the map were able to locate the creek with little difficulty and staked the first claims about July 8th, 1898. Public information concerning the new strike reached Alaskan ports on August 5th, and Victoria, B.C., on August 13th, 1898, and resulted in a rush to the area. By the close of the season it was estimated that over 3,000 people were in the new field and many of the principal gold-bearing creeks were staked, including Spruce Creek, the main tributary of Pine Creek, and probably the most important gold-bearing creek of the area. The first claims were staked on Spruce Creek in 1898 by Fred Marius, who reported good values from workings on the high rim around the mouth of Eureka Creek, a small tributary on the south side of the lower section.

It is interesting to note that when the camp was discovered it was claimed by the Mounted Police for the North-west Territories and the first claims were staked (250 feet long) under the laws of that Territory. Subsequently it was ascertained that the area was in the Province of British Columbia and claims were required to be staked 100 feet long, under the laws of the Province at that time. This caused chaos, but, to the credit of the camp, no disorder, and the many disputes were finally settled in 1899 by Mr. Justice Irving.

It is recorded that a noticeable feature of early operations in the Atlin Camp was the lack of experienced miners. This important feature explains many otherwise inexplicable aspects of former operations and their bearing on the varied progress of the area. Only the more evident "pay-dirt" along confined widths was worked by individuals, and much work was done in unfavourable sections. On Pine and Spruce Creeks large company operations using expensive and unsuitable plants were started before sufficient prospecting, drilling, or geological investigation had been done. For these reasons only partial recovery was made from some ground, but now the condition of certain old workings makes further recovery expensive or impossible. For the same reasons, many opportunities also exist in the Atlin area to-day on both old and virgin ground in practically unworked creeks and in pay-channel extensions on creeks such as Pine and Spruce. This aspect promises appreciable expansion in placer-mining activity in the Atlin area.

Since the discovery of the Atlin Camp there has been an appreciable but fluctuating placer-gold output. Although figures of production from each individual creek are not available, a study of records indicates that a large proportion of the total production has come from Pine and Spruce Creeks. The most substantial large-scale operations of the area were carried out on Pine Creek, where individual claims began to be absorbed by company interests in 1901, which continued large-scale operations to the commencement of the decline in 1917. Spruce Creek has been worked mainly by individuals, with a few minor company operations, since its discovery.

The recorded placer-gold output from Atlin is as follows:—

Year.	Oz.	Value.	Year.	Oz.	Value.
1898, discovery of camp	3,750	$75,000	1918	10,725	$214,500
1899	40,000	800,000	1919	8,450	169,000
1900	22,500	450,000	1920	6,750	135,600
1901	15,000	300,000	1921	6,930	138,600
1902	20,000	400,000	1922	6,930	138,600
1903	22,000	440,000	1923	7,570	156,500
1904	26,500	530,000	1924	8,647	147,000
1905	23,750	475,000	1925	2,896	49,229
1906	22,750	455,000	1926	2,607	44,318
1907	20,400	408,000	1927	2,428	41,276
1908	10,150	203,000	1928	3,174	53,958
1909	10,000	200,000	1929	2,408	40,936
1910	13,750	275,000	1930	3,141	53,397
1911	11,250	225,000	1931	8,384	142,528
1912	14,500	290,000	1932	8,040	155,684
1913	15,750	315,000	1933	11,299	265,751
1914	16,100	322,000	1934	10,039	284,832
1915	18,850	377,000	1935	13,227	382,797
1916	16,925	338,500	1936	18,423	530,726
1917	15,250	305,000			

The Atlin placer-gold area lies on the eastern margin of the Coast Mountains bordering the south-easterly extension of the Yukon Plateau. These two bordering and contrasting physiographic provinces merge into each other across a comparatively narrow transitional belt.

The characteristic ruggedness of the Coast Mountains is exemplified in an irregular complex of serrated peaks, of 7,000 to 8,500 feet elevation, some domed ridges of lesser altitude, steep, bluffed slopes to deeply-eroded and heavily-timbered valleys, extensive snow and ice fields, glacier cirques and glaciers extending to the heads of the valleys. The Transition Zone, which embraces the Atlin section, is a mature upland surface, dissected by deep, wide valleys flanked by generally dome-crested mountain ridges and ranges of 4,000 to 6,000 feet elevation, with steeply-sloping and locally truncated sides. The valley-bottoms, terraced, rolling, and drift-filled, are lightly timbered with black pine, balsam-fir, white and black spruce, aspen and balsam poplar, willows, alder, and dwarf birch. The best timber is patchy and averages from 12 to 18 inches in diameter. Berries of various kinds are plentiful and a profusion of northern and alpine flowering plants and shrubs grow in the valleys and on the mountain slopes and crests.

Geology.—The rocks underlying the Atlin area consist of a very irregularly-distributed complex of varied lithological character. This complex condition is responsible for extreme variations in short distances, in texture and hardness of the bed-rock, and consequently requires detailed investigation for correct determination of the most suitable placer-mining methods. Most widely distributed in the area is a series several thousand feet thick composed of grey and black slates in part micaceous, limestone, quartzites, and cherty quartzites. The bed-rock of the upper section of Spruce Creek is composed of these rocks. In the O'Donnel River area these rocks are also widely distributed together with appreciable limestone areas. Next in age sequence is a series of hornblende-schist, pyroxenite, peridotite, serpentine, greenstone, and magnesian rocks comprising the so-called "Gold series." These rocks occupy the lower and central section of Spruce Creek Valley and the entire lower section of Pine Creek Valley between Surprise Lake and Atlin Lake. These rocks, although varying in hardness, are generally weathered, friable, and soft, locally of a clayey character. When they are not intruded by hard dyke-rocks they are well adapted to bed-rock placer-mining. These various rock formations are intruded by stocks and bosses of granitic rocks, satellitic to the Coast Range batholith. Such intrusives largely comprise the Fourth of July Valley area and exposures extend south-easterly to the higher elevations of Munro Mountain. There is also an extensive exposure of granitic rock occupying both sides of practically the entire Surprise Lake area. It does not form, however, any part of the Pine Creek valley-floor between Surprise Lake and Atlin Lake, or of Spruce Creek Valley. Hard and compact granitic and felsitic dykes invade these various formations throughout the area, and are frequently exposed striking north-westerly across Pine Creek, but are not so frequently seen in the Spruce Creek section. In the Ruby Creek area, west of the Lower Surprise Lake section and in the adjacent Volcanic Creek area to the west, a bed of late Tertiary basalt occurs. This originates from an extinct crater situated at the head of Ruby Creek. Locally, cemented gravel deposits occupy the preserved beds of pre-Pleistocene creeks and rivers. Overlying these and flooring the valley-bottoms are superficial accumulations of glacial drift and aqueoglacial gravel, sand, and clay deposits, locally up to about 200 feet in thickness. Bed-rock and rim-rock, however, frequently outcrops through these superficial deposits. A thin layer of soil covers the surface of the area, excepting on steep mountain-slopes and bluffs and rock-knolled mountain crests.

Pine Creek.

General.—Pine Creek occupies a trough extending south-westerly for about 30 miles from the headwaters of Boyd Creek, through Surprise Lake to Atlin Lake. Boyd Creek, which drains into Surprise Lake, is deeply incised in a low, thickly drift-covered divide to Consolation Creek. Surprise Lake, elevation 3,160 feet, is about three-quarters of a mile wide and 13¼ miles long. Its upper section is confined between precipitous bluffs of granitic rocks that rise abruptly to the bare mountain-crests of 4,500 to 5,000 feet elevation. Towards the southerly end of the lake the valley-floor flattens to gentle hillocked slopes deeply covered by glacial drift and bordered by steep slopes of the confining mountains.

Pine Creek proper occupies a trough about 12 miles long draining from the southerly end of Surprise Lake into Atlin Lake at elevation 2,200 feet. The valley is about 2¼ miles wide between the confining steep slopes of Munro Mountain on the north and Bald Mountain on the south. The valley-floor is deeply buried by glacial drift to about 3,300 feet elevation in the Surprise Lake section and to 2,900 feet elevation 7 miles south-westerly from the lake. In the upper 3 miles of this stretch deep glacial drift extends across a width of about 1¾ miles. In the central 4-mile stretch the deep drift covers a width of about three-quarters of a mile. At about 7 miles from Surprise Lake and continuing for about 4 miles to the mouth of Pine Creek the valley "fans out" to a wide, flat expanse floored with lacustrine deposits through which a few rock knolls and low ridges outcrop. With the exception of the rock canyon at "Halfway," about 3½ miles from its mouth, the rocky section of "Stevendyke," about 1½ miles above "Halfway," and a rocky area three-quarters of a mile long about 3½ miles below Surprise Lake, Pine Creek has incised its course mainly through deep glacial and aqueoglacial deposits.

A series of sloughs and small lakes characterizes the upper end of Pine Creek in the neighbourhood of Surprise Lake and the mouth of Birch Creek. In the lower section the creek-bed is from 40 to 80 feet wide. In the lower 4¾ miles of its course the creek-gradient is about 2 per cent.; in the central 4¾ miles it is about 1.5 per cent.; and in the upper 2½ miles to Surprise Lake the creek has a flat gradient of slightly less than 1 per cent. The valley-floor is lightly timbered in the lower section with hemlock, spruce, fir, birch, and willow, with comparatively light underbrush. In the central section up to the south end of Surprise Lake the valley-floor is lightly carpeted with mainly small willow-bushes and underbrush. The best timber occupies a belt along the foot of the steep slopes of Munro and Bald Mountains from 150 to 300 feet above the creek-trough. A good motor-road extends from the town of Atlin to Surprise Lake and along the north shore of Surprise Lake to Ruby Creek, a distance of 16 miles. Branch roads extend up Birch Creek on the north side of Pine Creek and up Boulder and Ruby Creeks on the north side of the lower end of Surprise Lake. A branch road also extends to the central section of Otter Creek and crosses to the upper section of Wright Creek on the southerly side of the lower end of Surprise Lake. On the north side of the lower end of the valley, roads also branch to Trond Gulch and to Como Lake and Fourth of July Creek. On the south side a branch road extends up Spruce Creek for a distance of 4½ miles from the Pine Creek Road. A high-bench road also extends to the headwaters section of Spruce Creek.

History.—Gold was discovered on Pine Creek a short distance east of the present site of the old town of Pine City ("Discovery") in 1897, and news of this reached the "outside" in the early autumn of 1898. In that year about 3,000 people rushed in and about $75,000 was produced. In 1899 the creek was staked along its entire length from Surprise Lake to Atlin Lake and gold-bearing gravel had been found from slightly below Discovery claim to about 1 mile above, and it is recorded that no work was done above or below these points. On account of the small 100-foot claims allowed under the mining laws of that period and the refusal of claim-holders to permit dump-space on their ground to adjoining claim-holders, the limited work done was mostly confined to the creek-bed and very few benches were worked. For the same reason, coupled with the flat creek-gradient, operations were severely handicapped by drainage difficulties and high-water washouts were frequent. Several shafts were also sunk in the bench of Pine City through blue glacial clay, but these workings were flooded before bed-rock was reached. In 1899 it is estimated that 640 men were working and about $95,872 was expended on construction of wing, tail, and head dams, sluice-boxes, water-wheels, pumps, etc., and despite the difficulties encountered, an output for the camp of 40,000 oz. gold, valued at $800,000, the highest yearly output in the history of the Atlin Camp, is recorded, the bulk of this being produced from Pine Creek.

In 1901 miners began leaving for the Yukon, individual operations declined, and claims began to pass to the hands of hydraulic companies. Drifting operations on "Gold Run" and Pine Creek are recorded as not being remunerative except at the mouth of "Gold Run," where exceptionally good values were encountered. These values prompted the conception at that time that the "gold run" of Pine Creek came from the area known as "Gold Run" on the south side of Pine Creek, and that the continuation of the gold-bearing channel must be sought along the small trough of Gold Creek ("Gold Run"). Regardless of the apparent structural evidence contradictory to this supposition, much shaft-sinking and drifting, even the installation of an expensive dredge, has been done in the "Gold Run" area in the unsupported belief of the existence there of the continuation of the old gold-bearing channel of Pine Creek. Strangely, that belief is still held by many in the Atlin Camp, or it has been assumed that at this point on Pine Creek, for some unknown reason, the gold-bearing old channel is "lost," has suddenly stopped, or has been obliterated. There is no doubt that a small meandering gold-bearing channel does exist along "Gold Run" and the high values at this point on Pine Creek can be ascribed to the junctioning of this channel with the Pine Creek channel. The structure governing the continuation of the old channel of Pine Creek under the bench of the north side of the creek will be discussed under the heading of "Geology."

In 1901 the Atlin and Willow Creek Mining Company commenced operation, extended construction of ditches, flumes, etc., and installed a boiler and steam-pump. Other companies preparing for operation were Sunrise Hydraulic Mining Company, Pine Creek Power Company, and Stevendyke Hydraulic Syndicate.

In 1903 the British-American Dredging Company, Limited, acquired property, imported a Keystone drill, expended about $20,000 for drilling on "Gold Run," and brought in a Bucyrus dredge and an elaborate Stillwell-Bearce electric-power plant rated at 500 horse-power. The

power plant was installed a short distance below "Halfway"; ditches, flume, power-line, dams, camps, etc., constructed at a cost of about $300,000 and the dredge placed on "Gold Run." This dredge was an open-connected link-and-pin type with 96 buckets of 3 cubic feet and a capacity of 2,500 cubic yards per day under favourable conditions. Gold-saving tables were carried on a separate scow in tandem with the dredge. During this year J. M. Ruffner, to whose energy can be credited much of the placer and lode activity in the Atlin area up to the time of his death in April, 1929, commenced hydraulicking operations with the North Columbia Gold Mining Company. The Eastern Hydraulic Mining Company also inaugurated hydraulicking on the south side of Pine Creek above "Discovery."

In 1904 the British-American Dredging Company, Limited, operated its dredge on "Gold Run" intermittently. Much trouble was encountered in attempts to dig the tenaciously clay-cemented gravel, especially where it was bouldery. To loosen the ground, blasting in Keystone-drill holes ahead of the dredge was resorted to. Break-downs were frequent and before the season closed the bucket-lips were damaged beyond repair. Bed-rock, which in this locality is about 30 feet below surface, was not reached and the operation was suspended after about 25,000 cubic yards were dug. It was demonstrated that this type of dredge was totally unsuited to the conditions encountered. The gold-saving plant also proved unsatisfactory, and it is recorded that a test-sluicing of tailings recovered more gold per cubic yard than was extracted by the plant. Three other companies also operated on Pine Creek during 1904 in the neighbourhood of Pine City.

The year 1906 ushered in a period of extensive large-scale mechanical operations, mainly hydraulicking, on Pine Creek. In this year the Atlin Consolidated Mining Company was organized by the Guggenheim interests and acquired property on the north side of Pine Creek, between "Discovery" and "Gold Run." A 70-ton Bucyrus tractor steam-shovel, with a 1¾-cubic-yard dipper and a capacity of 3,000 cubic yards per day, was installed. For gravel-haulage to an elevated screening and washing plant, a 5-ton electric locomotive, with 40 dump-cars, was used. To loosen the cemented gravel ahead of the shovel, blasting in "powder-drifts" was utilized. Hydraulicking with water pumped from Pine Creek by a 10-inch rotary electric pump driven by a 50-horse-power motor was also used. Electric power for this operation was supplied by the British-American Dredging Company's plant. At the close of the season a production of $25,000 was credited to the shovel operation. The jointly-operated North Columbia Gold Mining Company and Pine Creek Power Company also produced $70,000 in this season. During this year about 100 men, of whom about thirty were individual miners, were working on Pine Creek.

During 1907 the Atlin Consolidated Mining Company steam-shovel came into full operation and in 1908 is officially recorded to have "produced the largest output in the camp." Due, however, mainly to a "humpy" bed-rock and consequent drainage difficulty preventing a thorough working of the low and softer portions of bed-rock, operation was suspended at the close of the 1909 season. Following this, the Atlin Consolidated ground was hydraulicked by the North Columbia Company on a contract basis of the yardage moved. In 1907 the jointly-operated North Columbia and Pine Creek Power Companies commenced construction of a ditch to bring water from Surprise Lake to the south side of Pine Creek above "Discovery." This ditch, about 5 miles long, 26 feet wide at the top, and 6 feet deep, was calculated to carry 15,000 miners' inches on a grade of 8 feet to 1 mile. It was completed in the autumn of 1908 and was responsible for increased hydraulicking on Pine Creek in the following few years. Hydraulicking of the Atlin Consolidated ground was commenced in 1910, and from that year to the end of the 1913 season the North Columbia Company operated from six to fifteen 6- and 7-inch monitors each season, mainly on the north bank of the creek. It is apparent from a study of the ground and old records that drainage and tailing-disposal difficulty was experienced. At times three No. 6 Giants with 6- and 7-inch nozzles worked in each pit, with one Giant stacking tailings. An idea of the character of the work can be gathered from the operation in 1912 with twelve to fourteen monitors and a crew of fifty-five men. For the purpose of blasting clay and boulders a Sullivan air-compressor and three hand-stoping drills were used. About 50,000 square yards of ground were uncovered on the north side, 310,000 cubic yards of gravel were moved, and 16,525 square yards stripped. The average depth of the bank was 61.5 feet. An output of $72,440.95 is recorded, and the gravel sluiced was estimated to carry 36.7 cents per cubic yard or $2.35 per square yard of bed-rock.

In 1914 the old companies were reorganized into the Columbian Mining Company, which commenced operations in that year with a crew of fifty men and continued to 1917. Some criteria of the hydraulicking operations from 1910 to 1917 by the North Columbia and Columbian Companies are presented by the following tabulation:—

Year.	Cu. Yds.	Sq. Yds.	Total Bullion.	Value Cu. Yd.	Value Sq. Yd.	Average Depth.	Season Close.
				Cents.			
1910	159,610	44,305	$71,751.22	45.0	$1.62	10' 7"	Nov. 9
1911	176,090	32,360	65,652.59	37.5	2.21	18' 3"	Nov. 3
1912	197,600	30,805	72,440.95	36.7	2.35	19' 3"	Nov. 2
1913	181,100	23,235	81,148.82	44.8	3.49	23' 4"	Nov. 12
1914	167,500	18,140	53,319.06	31.9	2.90	27' 8"	Nov. 7
1915	168,900	15,425	64,213.95	38.0	4.16	32' 10"	?
1916	?	?	?	?	?	?	?
1917	?	?	41,000.00	?	?	?	?

In view of the discussion to follow under the head of "Geology," it is important to note that the 1915 and subsequent work was carried out on the north side of Pine Creek at the easterly extremity of the old hydraulic cut shown on the accompanying map and on the west boundary of the *Besbrook* lease. It will be observed that in this locality the pits were veering north with rim and bed rock sloping flatly north-westerly.

During this period individual mining on Pine Creek decreased and was confined to a few drifting operations, mainly under the north bank between the hydraulic cut and "Gold Run" and around the mouth of "Gold Run." Individuals are also reported to have made good recoveries from the sluicing of old hydraulic tailings. In 1909 and 1910 L. B. Harris prospected "Gold Run" with a Keystone drill, locating bed-rock at depths varying from 29 to 40 feet, but failing to find the "pay-streak."

Between 1911 and 1914 the Pine Creek Flume Company did some work with a donkey-engine and drag-line scraper at elevation 2,950 feet on the high bench about 1,000 feet north of the easterly end of the hydraulic cut. This company (C. L. Queen) also did extensive ditching and damming in an effort to bring water to their north-side operation from the small, shallow lakes on the high bench of the north bank and from Birch Creek.

In 1918 operations had dwindled to two groups of lay-men using five Giants, with a reported recovery of $25,000, and some drifting. Work was also done by the Atlin Gold Mines Company, a new J. M. Ruffner organization, which acquired the Atlin Consolidated leases and plant. In this year the assets of the North Columbia, Pine Creek Power, Columbian Mines, and O'Donnel Placers Companies were acquired by F. H. Mobley, of Prince Rupert, who later conveyed a one-half interest to L. Schulz, of Atlin. A new organization called Discovery Mining and Power Company, Limited, was formed, and between this year and 1923 operations dwindled mainly to drifting by lay-men and some sluicing of old tailings. By 1924 activity on this once-famous creek had declined to one small hydraulic outfit and a few individual miners and Pine City ("Discovery") had become a "ghost camp."

In 1925 hopes were revived by the bonding of the Discovery Mining and Power Company's property by Charles V. Bob, of New York. In the hope of uncovering the down-stream continuation of Pine Creek old channel, and without any preliminary drilling or detailed geological investigation, these interests installed an elaborate plant and, starting at the lower end of the "Halfway" canyon, commenced an excavation in lacustrine gravel which is now locally known as the "Panama Canal." Using from two to three monitors, this operation continued to the end of the 1930 season, when it was suspended. The result was a cut about 3,750 feet long, 200 to 300 feet wide at its top, and varying in depth from 160 to about 20 feet between its lower and upper ends. About 2,750,000 cubic yards of gravel and sand were moved and only a very insignificant quantity of fine gold was recovered. In one or two places smooth, glaciated rim-rock was encountered sloping from 5 to 10 degrees southerly.

In 1932 Fred Hehn and Company of five lay-men commenced hydraulicking on the south bank of Pine Creek ("Tar Flats"), about 1 mile below the mouth of "Gold Run." As is indicated on the accompanying map at the extreme easterly end of the old hydraulic cut on the south side of the creek, this work is very clearly on the left rim of Pine Creek old

channel with rim-rock dipping about 5 degrees northerly. A good recovery was made in this working during the two years of its operation. The north-easterly strike and northerly slope of the rim-rock gradually veered the succeeding pits towards the creek, and the floor rim-rock at the east end of the last pit excavated in 1933 is 5.5 feet below the water-level of Pine Creek, from which it is protected by a narrow bank-pillar. With a short stretch of workable rim-ground on the south bank still ahead of the last pit, the operation was forced to suspend on account of water-right complications.

In 1933 Keystone-drilling in 24 irregularly-spaced holes reported to average about 19 feet deep to bed-rock was done by Vancouver interests, starting 900 feet above "Stevendyke" bridge and continuing down-stream along the bed of Pine Creek for about 5,500 feet. In 1934 an hydraulicking operation was started on this ground by Northern Goldfields Exploration, Limited, composed of Toronto interests. To facilitate the operation the creek was turned into the "Panama Canal." Due to drainage difficulty and an insignificant recovery of only fine gold, the operation was suspended before the close of the season. In places where rock is uncovered by this work it is a characteristically hard, humpy, and smoothly-glaciated greenstone rim-rock, locally covered with blue glacial clay.

During 1934, 1935, and 1936 several individual miners have made fair recoveries from cleaning bed-rock in the old Columbian and Atlin Consolidated hydraulic pit. Drifting under the north bench in the upper section of this pit, towards the right rim of the old channel, has also returned fair recoveries. Drifting on the south side of Pine Creek in the locality of the mouth of "Gold Run" has also been continued by two individuals. In 1936 a small local syndicate commenced hydraulicking a strip of left rim-ground on the south bank of the old hydraulic cut opposite "Pine City" ("Discovery").

The bulk of the work on Pine Creek since 1898 has been confined to the central part of the valley in the neighbourhood of "Pine City" ("Discovery"). In this section the old hydraulic cut, 9,000 feet long, 500 to 1,125 feet wide, and from 25 to 60 feet deep to flat bed-rock, with its great piles of tailings, is an outstanding feature. Individual miners' old shovelling workings are seen in shallow rim-ground in the localities of "Stevendyke," "Pine City," and on the north side of the old hydraulic cut near Willow Creek, about 2,400 feet easterly of "Pine City." In the high rim-rock area westerly of "Pine City" and north of the road several cuts and trenches have been excavated through shallow glacial debris to rock. Exploratory shafts have been sunk on the north bench in several localities, but these are all filled with water. Judging from the dumps, these had been sunk mostly in blue glacial clay and had not reached bed-rock. One of these, known as the "Guggie" shaft, was sunk adjacent to the road on the north bank about 1,000 feet west of the east end of the old hydraulic cut. The depth of this shaft is not known, but it is reported to have encountered good values in "chicken-feed" creek-wash. It is estimated that at this point it is about 40 feet to the old channel bed-rock. Along the north side of the upper section of the old hydraulic cut the caved portals of several old adits and inclines are seen. On the north side of Pine Creek between the east end of the old hydraulic cut and the bridge are remains of apparently fairly extensive drift-workings under the north bench. These are caved or flooded, and it is understood, where bed-rock was reached, encouraging values were encountered, but drainage difficulties forced suspension of work. In the 1932 Annual Report of the Minister of Mines the probability of the old channel crossing to the north bank of Pine Creek above the bridge was suggested. Following this, a shaft was sunk 30 feet in glacial clay at elevation 3,004 feet by E. H. Woodean. This point is 72 feet above Pine Creek and is about 75 feet above the estimated position of the old-channel bed-rock. The shaft is being continued intermittently during the winter months.

During the 1936 season W. Kennedy was drifting up-stream under the north bench in an adit 1,950 feet west of the east end of the old hydraulic cut. In this working, flat, weathered bed-rock, humpy in places, with a gradient of about 1.2 per cent. is exposed, overlain with cemented creek-gravel. About 78 feet westerly of this working another adit driven by Kennedy for 261 feet along a bearing of north 10 degrees east shows flat weathered and humpy bed-rock to within 15 feet of the face, where the rim gradually rises to a height of 1.5 feet in the face. About 132 feet westerly of this an adit driven for 243 feet along a bearing of north 2 degrees west encounters rim-rock rising to 5½ feet in the face. About 2,000 feet east of Kennedy's adit, G. Borquist has sunk an incline sloping 24 degrees for 20 feet to bed-rock under the north bench and is drifting up-stream. These workings are located about 100 feet east of No. 1 post of the *Besbrook* lease and are badly flooded. Correlation of elevations on bed-rock between this point and the Helm hydraulic cut to the south-east shows bed-rock sloping 1 degree north-west. At Pine Creek it is 6 feet below the creek water-level and at the foot of the Borquist incline it is 7½ feet below the creek.

Geology.—The part of the extensive alluvial fan extending up-stream from the mouth of Pine Creek to 6,100 feet east of "Halfway" was formed when Atlin Lake stood at a higher level. The superficial deposits of the fan area include lacustrine, aqueoglacial, and glacial deposits. In a few exposures along the "Panama Canal" the alluvial deposits rest on glacial drift, which in turn rests on smooth, glaciated bed-rock. Glacial drift and inter-Glacial wash is also seen resting on bed-rock at the foot of the "Halfway" canyon at 2,414 feet elevation, and in places on high rim-rock at 2,600 feet elevation just east of "Halfway." Two instances of small lengths of decomposed clayey rock flanked and overlain by glacial debris and lying on smooth glaciated bed-rock were observed at widely separated points along the bottom of the "Panama Canal." In one such instance at the foot of "Halfway" canyon a small patch of decomposed rock 4 feet thick, lying on glaciated greenstone, is overlain by 4 feet of typical old-channel gravel, which in turn is overlain by glacial drift. On both sides of this, glacial drift rests on bed-rock. These weathered masses are evidently erratics.

"Halfway" canyon is a narrow, rugged, and vertical-sided incision in rock with pot-holed floor, in places obstructed by large, jagged slide-rock blocks. Its vertical, rugged sides and freedom from any sign of glacial action clearly show that it is post-Glacial in age. From the head of the canyon to its foot there is a fall of 138 feet in a length of 1,500 feet. Since Pine Creek is now by-passed through the "Panama" canal the canyon can readily be examined. The bed-rock of Pine Creek at the head of "Halfway" canyon is 86 feet above the bottom of the "Panama" canal. At this point exposures of rim-rock in the floor of the cut are overlain by glacial drift and slope from 10 to 20 degrees south-easterly. In the floor of the cut about 450 feet from its easterly end an exposure of fresh rim-rock overlain by glacial drift also slopes 10 degrees south-easterly. The exposures and general aspects in this locality indicate that Pine Creek in this section occupies a post-Glacial channel and that the floor of the trough is situated a short distance south of the "Panama" canal and at a lower elevation than the bottom of the cut. Projecting Pine Creek pre-Glacial bed-rock from elevation 2,819 feet, opposite "Pine City" for a distance of 1,050 feet westerly, with an assumed average bed-rock grade of 1.3 per cent. as indicated in the old "Discovery" hydraulic cut, would place the old-channel bed-rock at elevation 2,682½ feet at a point slightly south of the central section of the "Panama" canal. In other words, this projection would place Pine Creek pre-Glacial channel about 82½ feet above the top of the "Panama" canal. For the projected old channel to coincide with elevation 2,466 feet at the bottom of the central section of the "Panama" canal would require an average gradient of 3.3 per cent. from elevation 2,819 feet in the old cut at "Pine City." Rim-rock exposures in the "Panama" canal cut, as already cited, indicate the floor of the trough in this locality to be at an even lower elevation than the bottom of the cut, requiring a gradient in excess of 3.3 per cent. for coincidence with the projected pre-Glacial channel.

In former years it had been locally supposed that the old channel of Pine Creek had veered southerly from "Discovery" and flowed through and across "Stevendyke" at about its westerly end. The alignment of high rim-rock and correlation of levels in this section do not support this theory. The continuation of high rim confines the pre-Glacial channel on this side. Theories have also been advanced that the old channel continued from the old hydraulic cut under the north bench below "Pine City" and flowed north-westerly through Trond Gulch. Obstructing high rim-rock and correlation of levels prohibit this possibility.

Alignment of rim-rock along the southerly side of the easterly end of the old hydraulic cut, especially in the locality of the Helm workings at the extreme east end of the cut, clearly confines the old channel on this side. At the east end of the Helm workings the south rim leads into Pine Creek and strikes north-easterly across the creek, placing the north-easterly continuation of the south rim of Pine Creek pre-Glacial channel under the moraine bench of the north bank of the present creek-site. Above the Helm workings Pine Creek has incised its new channel from 6 to 20 feet into high rim-rock, which continues along the south bank for about 400 feet easterly of the Helm hydraulic pit. From this point for a distance of 700

feet up-stream to the bridge is a gap in rim-rock outcrop. At the bridge high rim-rock again outcrops along both the north and south banks of Pine Creek. At the edge of a rim-outcrop on the north bank of the creek about 200 feet above the bridge, an old caved adit under the bench, which at this point is 25 feet high, is reported to have been driven 150 feet. The face of the adit is reported to be wholly in the high rim. About 900 feet easterly of this point, another caved adit is reported to have been driven 200 feet under the bench, with rim-rock rising to a height of 4 feet in the face. At this point the bench is 40 feet above Pine Creek. These points line up with the strike of the south high-rim ridge confining the old channel along the easterly end of the old hydraulic cut. Above this point rim-rock outcrops for frequent and continuous stretches along Pine Creek and the contiguous road for a distance of about 8,250 feet above the bridge. The present channel of Pine Creek is incised from 5 to 15 feet deep in these rock-exposures. The vertical and rough sides of the confining rock banks clearly indicate this channel to be post-Glacial in age.

The area of the north bench, under which the north-easterly continuation of Pine Creek pre-Glacial channel projects, is continuously covered with morainal and aqueoglacial deposits, from about 40 to 75 feet above the elevation of Pine Creek. Along the north bank of Pine Creek, and commencing about 360 feet up-stream from the upper caved adit, a flat bench from 10 to 20 feet above the creek and 1,200 to about 2,250 feet wide ("Birch Creek flats") borders the high bench. This probably represents the post-Glacial erosion of Pine Creek preliminary to its confinement in its present channel. Towards Birch Creek the high bench gradually lowers in elevation to merge with "Birch Creek flats." Where the high bench has sloughed it is seen to be composed of glacial clay and drift, with small local areas of weakly-imbricated aqueoglacial gravel. At one place, about 1,500 feet up-stream from the bridge, an isolated patch of the typical yellow, pre-Glacial creek-gravel of the area occurs isolated in the glacial deposits of the north bank high bench. This is evidently the result of transportation and redeposition.

The gap of 700 feet in the south rim of Pine Creek pre-Glacial channel below Pine Creek, already referred to, marks the junction area of the old "Gold Run" channel with the old channel of Pine Creek. As would be expected with such a condition, high values are reported to have been encountered at this point by drifting at the mouth of the "Gold Run" channel and by shovelling from the bed of Pine Creek below the mouth of "Gold Run." In the old drift-workings at the mouth, bed-rock of the old "Gold Run" channel at this point is about 10 feet below the water-level of Pine Creek. Several shafts have been sunk and some drifting done in intermittent sections along a stretch of about 4,500 feet of the "Gold Run" channel. These old workings are either caved or flooded, but bed-rock or rim is reported to have been encountered at depths varying from 12 to 40 feet. In H. Woodean's shaft-workings, about 650 feet west of the old dredge, bed-rock is encountered at a depth of 30 feet. A winding channel about 20 feet wide between rims and with a bed-rock gradient of about 1.5 per cent. is indicated in the drifting and crosscutting. This is overlain by from 4 to 8 feet of cemented gravel, with moderate distribution of boulders up to an average maximum of about 24 inches in diameter. Larger boulders are sometimes encountered. Bed-rock is generally decomposed and clayey for a depth of about 18 inches, but varies in hardness and composition and is characteristically "humpy." Water is pumped by a Cornish pump and values are reported to average about 0.06 oz. gold per cubic yard of bed-rock gravel. The north high rim of "Gold Run" old channel exposed along the road is the south high rim of the projected pre-Glacial channel of Pine Creek in this locality.

Pine Creek pre-Glacial channel is well exposed in the old hydraulic cut opposite and above "Pine City." Bed-rock is of varying composition and consists mainly of serpentine, magnesian rocks, limestone, cherty slate, and quartzite intruded locally by granitic dykes. Of these, serpentine, magnesian rocks, and slate have the widest distribution. Bed-rock is generally appreciably weathered to a soft clayey material, especially in the sections of serpentine and magnesian rocks, but hard, "humpy" sections also occur. The gradient is not constant, but averages about 1.3 per cent. The best values occur on and in bed-rock. Values recovered in large-scale operations are cited in the section of this report dealing with history. This is indicated as only partial recovery, and good recoveries have and are being made by individuals resluicing tailings and shovelling worked bed-rock, especially in low soft sections. Relative to this phase of the old operations, it is interesting to note that a nugget weighing 49 oz. was picked up in 1925 on one of the old hydraulic tailings-dumps.

The old channel bed-rock is overlain by from 10 to 20 feet of cemented creek-gravel. In this boulders are not abundant and range to a maximum average of about 30 inches in diameter. In the old hydraulic cut a channel-width of about 1,000 feet between rims is indicated. The cemented creek-gravel is overlain by 15 to 30 feet of blue glacial clay and drift in which is locally included some aqueoglacial wash-gravel and sand. In W. Kennedy's adit-workings, already referred to, under the north bench, 1,950 feet westerly from the extreme easterly end of the old hydraulic workings, the operator reports recoveries varying from 2 to 3 oz. gold from 40 square feet of bed-rock. It is significant that these workings are on the north rim-side of the channel at the commencement of the projection of the old channel continuation under the north bench of Pine Creek.

About 1,400 feet westerly of Kennedy's workings, near the mouth of Willow Creek, Geasen and Hoffman are shovelling-in soft bed-rock from a low area in the old hydraulic workings along the north rim and report good recoveries. About 50 feet west of this place the north rim rises steeply to a rock bench 15 feet high and from its crest slopes 15 degrees north under the road. Several cuts through this rim have been made by "old-timers" in the attempt to strike bed-rock to the north. In every instance where it has been crosscut the rim continues with a northerly dip. Tracing this rim westerly for 2,250 feet to the clay bluff, 300 feet easterly from "Pine City," it is seen to retain its northerly dip in several exposures. In the face of the bluff it is overlain by glacial clay at 20 feet above the level of Pine Creek. An incline, now caved, has been sunk on the rim at this point. These exposures indicate in this section a possible channel lateral to and north of the known old channel of Pine Creek.

Cross-sectional traverses of Pine Creek Valley failed to establish the existence or preservation of any high-bench pre-Glacial channel. At elevations 3,000 and 3,200 feet, along the foot of Munro Mountain, remnants of two rock benches were observed. These show evidence of glaciation and several lakes and swamps now occupy shallow depressions along them.

Conclusion.—(1.) The location of Pine Creek pre-Glacial channel is indicated along the course shown on the accompanying map.

(2.) It is indicated that Pine Creek pre-Glacial channel does not contain auriferous deposits in its westerly section commencing somewhere between "Pine City" and the "Panama Canal."

(3.) Pine Creek pre-Glacial channel is indicated to continue under the north bench of Pine Creek, striking in a general direction of north 56 degrees east from the easterly termination of the old hydraulic workings and towards Birch Creek Flats. Along this projection the old-channel bed-rock is indicated to lie at from about 40 to 90 feet below the surface.

(4.) The length of sectional lengths of pre-Glacial channel that have not been affected by glaciation along the projection of this north-easterly extension to Surprise Lake are unknown. This factor requires determination by drilling or other exploratory methods.

(5.) The old channel is known to be gold-bearing at the termination of the most easterly workings on it. The continuation and extent of gold content along its north-easterly projection are unknown and require determination by drilling or other exploration methods.

(6.) A flat and uneven old-channel bed-rock gradient is indicated. Details of this factor, together with the character of bed-rock and the overlying superficial deposits along the projected extension, will determine the method to be employed in any possible operation and will have to be ascertained by drilling or other exploration methods.

(7.) Local remnants of likely south rim-ground still remain in the central section of the old hydraulic cut.

(8.) Gold values are indicated as still remaining in sections of partially-worked bed-rock and also in the now weathered and slacked clayey tailings-dumps in the old hydraulic workings.

(9.) The present bed of Pine Creek in the old hydraulic cut along a stretch of about 8,500 feet is indicated as likely shallow ground. To make it accessible for investigation the creek can be readily turned from its present course at several places.

(10.) A lateral channel adjacent to and north of the known Pine Creek pre-Glacial channel is indicated. Verification of this and details of possible values, depth, etc., require determination by drilling or other exploratory methods.

Spruce Creek.

Spruce Creek flows north-westerly into Pine Creek about 2½ miles from its mouth. It occupies a drift-filled valley about 15 miles long between elevations of 2,300 feet at its mouth and 4,000 feet at its head. It is reached by the Atlin–Surprise Lake Motor-road to "Pine City," from where a branch road extends for 4½ miles up the valley to the Colpe Mining Company workings. Another branch road follows along the high bench of the north side to Rose Creek, about 1¾ miles from the headwaters.

Towards its mouth the valley merges into the wide fan area of the lower section of Pine Creek Valley. Above this the valley is confined on the north by Bald Mountain and its easterly extension and on the south by the Monarch Mountain range. Between the steep slopes of these mountains the valley-floor in its central section is from 1½ to 2 miles wide and deeply filled with glacial drift. Above this towards "Blue Canyon" and the headwaters in the divide to the O'Donnel River at elevation 4,000 feet the valley flattens to a wide gently-sloping, moraine-covered area through which a few rocky ridges and knolls outcrop. The present channel of Spruce Creek is incised in the moraine deposits of the valley-floor which form hummocky benches from 70 to about 350 feet high bordering the creek on both sides. The main tributaries are Little Spruce Creek and Dominion Creek, flowing into Spruce Creek from its south side.

The creek occupies a moderately-winding channel from 20 to 30 feet wide in a trough 150 to 400 feet wide, and with the exception of five small rock canyons is confined along its entire length by moraine benches. Along its length the creek-gradient varies slightly, the steepest parts being in the rock canyons. In the lower section for 2.8 miles in the valley-fan area to the foot of the first canyon the gradient averages 2.7 per cent. For the next 3.3 miles up-stream to the foot of the second canyon at the Colpe Mining Company's workings the gradient averages 2.1 per cent. Up-stream from this point for 1.5 miles, including the second and third canyons to the foot of "Dry Canyon," the gradient steepens to an average of 4.8 per cent. From this point up-stream for 3.5 miles to the "Blue Canyon" area the creek-gradient gradually flattens to an average of 1.5 per cent. For the next 1.5 miles up-stream, through "Blue Canyon" to the locality of Rose Creek, the canyon is responsible for a slight increase of gradient to an average of 1.7 per cent. From this point for 2 miles to the headwaters in the O'Donnel River divide area the gradient flattens perceptibly to an average of 1.2 per cent. In the headwaters section the trough is flat and marshy with a gradient of less than 1 per cent. and gradually merges into the south-easterly slopes to the O'Donnel River drainage-trough.

Geology.—With the exception of the canyon sections and the headwaters area, rock-outcrops through the moraine deposits of the valley-floor are scarce and of small extent. Correlating these with exposures of the confining mountains and with bed-rock in the workings indicates the basal formation of the lower 9 miles of Spruce Creek, from about Rant Creek to the mouth, to consist of pyroxenite, serpentine, greenstone, and magnesian rocks of the "Gold series." Of these, greenstone, serpentine, and magnesian rocks have the greatest distribution. Up-stream from Rant Creek to and beyond the headwaters the formation consists of grey and black slates, cherty quartzites, and some limestone. Of these, the slate components appear to have the widest distribution.

During Tertiary time the valley of Spruce Creek was further eroded and a deeper channel incised in its former more mature valley. The valley was filled with glacial drift, in which the stream has cut a new channel, leaving the old channel, with its flatter gradient, deeply buried. A length of 16,500 feet of pre-Glacial channel is known to be preserved and richly gold-bearing, generally deeply buried by glacial drift. This has been extensively worked and mining is still continuing at many places along it and is proceeding up-stream along its established course in ground carrying good gold values. In former years, for some unknown reason, it had been assumed the old channel continued up-stream under the north bench north of the third canyon. In Bulletin No. 1, 1931, "Placer-mining in British Columbia," it was pointed out that the pre-Glacial channel crossed Spruce Creek between the high rock-rims of the second and third canyons and continued up Lower Dominion Creek trough. Subsequent mining has verified this and field-work during the 1936 season indicates a further stretch of at least 5 miles of favourable ground along the projected course under the south bench of Spruce Creek. Where it has been worked, weathered bed-rock of the old channel is overlain by from 6 to 10 feet of clay-cemented creek gravel, with boulders up to a maximum average of about 30 inches. Gold values vary from about ½ oz. to about 20 oz. per 40 square feet of bed-rock (one "set"). The grade of the old channel varies slightly, is locally "humpy," but averages about 1.8 per cent. in its worked section. In the upper stretch of 2,700 feet of this section the grade tends to steepen and is 2.2 per cent. The width of the old channel between rims varies from 600 to 1,200 feet in the lower section to about 375 feet in the upper section of its worked length. In places, especially in the wide section, there are two or more lateral and branching channels separated by a low rim of gently-sloping bed-rock. It is possible that the exceptionally rich ground of the most recently-worked up-stream section can be attributed to the narrowing of the channel in this direction.

Adjacent to the south rim of the old channel in the region of the first canyon a lateral and deeper channel is indicated. It is possible this may extend north-westerly beyond the extremity of the main channel, at sufficient depth to have been unaffected by glaciation.

In the 2.8 miles of the lower section of Spruce Creek, from its mouth to the first canyon, and embraced by the valley-fan within the boundary of the post-Glacial lake-level at elevation 2,660 feet, glaciation has been acute. Spruce Creek pre-Glacial channel bed-rock at elevation 2,732 feet is truncated and left hanging 22 feet above the water-level of Spruce Creek. This is at the lower end of the first canyon into the valley-fan area. At the portals of the drift-workings, heading south-easterly on the old channel at this point under the moraine bench, blue glacial clay rests on fresh bed-rock for a distance of about 100 feet along the old-channel course. Old-channel cemented gravel then begins to appear intermittently on weathered bed-rock until it reaches a thickness of 6 to 7 feet between bed-rock and glacial clay. About 1,100 feet down-stream from the first canyon a glaciated rock-exposure on the right bank of Spruce Creek at elevation 2,680 feet is overlain by blue glacial clay. Projecting Spruce Creek pre-Glacial channel bed-rock for 7,200 feet north-westerly from the first canyon, with an average grade of 2 per cent., places it at elevation 2,588 feet in the region of the upper section of the "Panama Canal." This is 49 feet above glaciated rock exposed at the bottom of the "Panama Canal" at this point. A projection for 8,100 feet north-easterly to the road 1,000 feet east of "Halfway" places Spruce Creek old channel at this point 20 feet below the level of the obstructing high rim-rock at "Halfway." This obstructs the possible continuation of the Spruce Creek pre-Glacial channel beyond "Halfway" towards Trond Gulch.

Gold was recovered by individual miners from shallow diggings on rim-rock along Spruce Creek, below the locality of the described pre-Glacial channel truncation. This can be attributed partly to transportation by Spruce Creek whilst cutting across the old-channel site and partly to reconcentration of gold scattered in the moraine by the creek cutting down to its present channel.

History.—Gold was first discovered on Spruce Creek in the locality of Eureka Creek in 1898. The early operations by individuals did not disclose particularly encouraging results. The ground was found to be deep; the small claims allowed at that time did not permit dump-space or drainage. In 1901 there were about 100 men on the creek and hydraulicking companies began to be interested. It was soon apparent, however, that water and dump requirements of hydraulicking operations conflicted with the individual miners who were working the comparatively shallow creek-ground in the locality of the first canyon. A limited amount of hydraulicking was carried out in the neighbourhood of the first canyon, at the east end of the second canyon, around the southerly end of the third canyon, and in the locality of Blue Canyon. In 1904, associates of the British-American Dredging Company incorporated the British Columbia Dredging Company and without preliminary exploration, excepting that in individual miners' workings, commenced installation of a dredge in the Blue Canyon area. Electric power for this was drawn from the British-American Dredging Company's plant on Pine Creek. The dredge was a Bucyrus open-connected type with 7½-cubic-foot buckets. Construction was completed in 1905 and after digging for a few weeks in 1906 the type of dredge proved unsuitable and operation was suspended. About 1905, Northern Mines, Limited, installed a steam-shovel in the creek-ground of the lower section. Good recoveries were being made all around the shovel by individual miners, but drainage difficulties and the depth of ground encountered caused suspension of the shovel operation about 1907.

Large-scale drifting under the south bench at the first canyon was carried out by the Spruce Creek Power Company (W. C. Hall and A. D. Hughes) between 1909 and 1916. During the same period extensive drifting was also carried out by McCloskey and Foley under the south bench on the *Gladstone* lease about 3,000 feet south-easterly from the first canyon. Contemporaneous with this, the south-bench ground north of the *Gladstone* to as far as Eureka Creek, including the *Peterboro*, *Poker*, *Joker*, and *Croker* bench leases, was opened by inclines to the old-channel bed-rock and continuous drifting with good recoveries carried on. During this period Spruce Creek became the most active and productive creek in the Atlin area, a position which it has retained.

In 1915 J. M. Ruffner commenced sinking a shaft on the north bank of Spruce Creek, opposite Eureka Creek, to explore for the continuation of the channel under the north bench in this locality. Drainage difficulty at first hampered operations in this section. With the establishment of drainage-adits, however, deep-drifting on the old-channel bed-rock has steadily progressed up-stream. In Bulletin No. 1, 1931, "Placer-mining in British Columbia," issued by the British Columbia Department of Mines, the continuation of the old channel south-easterly across Spruce Creek, between the second and third canyons, and up the lower section of Dominion Creek trough, was described. By the end of the 1936 season this had been verified by drifting to about the point where Spruce Creek crosses the channel-projection, in ground returning from 2 to 12 oz. gold to the "set" (40 square feet) and averaging from 4 to 5 oz. to the "set." Field-work during 1936 established the continuation of the old channel under the south bench for an appreciable distance beyond this point.

A remarkable feature of Spruce Creek is the fact that, despite the extensive drifting operations of early years under the south bench between Eureka Creek and the first canyon, mining has been continuously carried on in this section by individuals, both under the bench and in the creek-ground. In the lower section much of this drifting-work has required penetration of caved workings to reach pillars, or marginal ground lateral to or beyond the old workings. In general, fair recoveries have been made from this work. Of interest in this connection is the good recovery made by Carl Lykergard between 1933 and 1936 in drifting around the extreme southerly limits of the old McCloskey workings on the *Gladstone* bench lease, in a section about 900 feet under the bench from Spruce Creek. In 1936 a nugget weighing 44 oz. 3 dwt. was found by Lykergard in this locality. Unfortunately, no methodical surveying of the workings was done during the early operations and there are no maps, records, or plans of them. Their scope and extent is consequently not known and operations in and about them is necessarily haphazard or based on hearsay. Despite this, in some instances good recoveries have been made in and about old workings and generally the continued work has returned wages or better. Examinations by the writer of the accessible old workings indicates that these were generally carried along narrow margins of "pay." In many instances where flat, weathered bed-rock is continuous beyond these margins there has been no attempt at lateral exploration by crosscutting or continued drifting. In some instances the old workings are in a badly-caved condition; in others, possibly flooded through blocking of drainage-adits. The reopening of these is costly and hazardous and on account of the lack of survey-plans it is impossible to select points for new entries and workings that would be definitely known to circumvent the old workings.

In the section between the first canyon and Eureka Creek the old channel is wide and its southerly boundary indicated by the known limits of old workings and approximate correlation of rims at Eureka Creek and the first-canyon section. A remarkable feature in all the most southerly workings examined in this section is the absence of any high rim confining the channel on the south. In some places a low rim, rising to 2 or 3 feet above flat bed-rock, is seen and in three localities a slight dip to the south of weathered bed-rock occurs. In the steam-shovel cut south-easterly of the first canyon a low south rim of the main channel strikes south-easterly and at its crest slopes south-westerly. This is correlated with a similar low rim in the old drift-workings under the first-canyon bench and in a deep channel indicated by shafts to the north-west of these. These factors indicate a possible channel lateral to and south-westerly of the known old channel.

The shallow creek-ground, commencing up-stream from the first canyon at the point where the old channel emerges from under the high bench west of the canyon, has been worked and reworked continuously since the early days by shovelling, hydraulicking, and steam-shovelling for a distance of about 6,750 feet up-stream. In the upper section of this stretch along the north rim of the channel on the *Olalla* and *Tax* leases, the Columbia Development Company has been operating a steam-shovel continuously since 1934 on both virgin and formerly-worked ground. In 1936 the same company successfully operated a second shovel in the lower section on the *Lynx* lease. Up-stream from the *Olalla*, on the *Rose*, *Hope*, *Shamrock*, *Sally*, *Friendly*, and *Maska* creek claims, on the *Cassidy* group above these, and about 600 feet west of Eureka Creek, the creek-ground is largely virgin. In the lower section some drifting has been done, but drainage difficulty is experienced. In the upper stretch, including the *Sally*, *Friendly*, *Maska*, and *Cassidy* groups, test-shafts have been flooded. Depth to the old-channel bed-rock along this stretch of Spruce Creek varies from about 22 feet in the lower section of the *Olalla* lease to an estimated depth of 45 feet in the locality of Eureka Creek.

A characteristic of the Spruce Creek old-channel gravel is the tenacious yellow clay cementing it. This characteristic permits only partial recovery on first sluicing and sometimes is even the cause of sluice-box "robbing." After tailings-dumps have been exposed to weathering for some time the clayey material slacks and disintegrates and the resluicing of this material returns an additional recovery. For this reason old tailings-dumps on Spruce Creek are being continuously reworked and good recoveries have been made from them, sometimes after several such handlings.

Locally, wide streaks of clean "blue" gravel occur along comparatively clean-cut lines either in or overlying the "yellow" gravel. Frequently, these stretches of "blue" gravel or their lower contacts with the "yellow" gravel have returned exceptionally good values. This condition has given rise to a miners' theory of a later and richer "run of gravel," called the "blue run." In all such occurrences examined by the writer no evidence to suggest a second "gravel run" was observed. In some such occurrences, however, the ground was seen to be very wet, the gravel loose and washed comparatively free from ferruginous clay. In these cases the rich "blue run" could be explained by the washing of the "yellow" gravel by running springs or freshets accompanied by a reconcentration of gold on the underlying clayey "yellow" gravel. In other cases where a "blue" clayey gravel was observed the condition can be ascribed to a periodical variance in fine sediment carried by the original stream.

Lassie Creek Lease. This lease (P.M.L. 750) is owned by J. Pirnie, of Atlin, and is located about 1,500 feet westerly of the first canyon. On the north bank of Spruce Creek blue glacial clay occurs on glaciated bed-rock. In the creek-trough, 140 feet, south 59 degrees west from this point, the owner has sunk a shaft in creek-gravel and glacial clay for 10 feet. From the bottom of the shaft a pipe-drill has been driven an additional 36 feet in glacial clay. About 300 feet southerly from the shaft, fine post-Glacial gravel-wash rests on rim-rock sloping 12 degrees north-easterly towards the creek. Fine gold is being recovered from the sluicing of this material.

St. Quentin Lease. This ground is located on the high bench covering the old-channel location west of the first canyon. It adjoins the *Key* and *Lynx* leases on the north-west and the *Jewel* lease on the south-west. The ground was formerly extensively drifted by the Spruce Creek Power Company. W. Faulkner is continuing drifting and crosscutting around the south-easterly margin of the old workings and recovering from 70 cents to $1.50 per cubic yard of gravel sluiced.

Jewel Lease. This lease is owned by Teresa Beaton, Atlin, and is being worked on a "lay" by W. Carl Horn and Ole Hultgren. The ground is located west of the first canyon adjoining the *St. Quentin* on the north-east and covers the easterly side of the old channel under the high bench. The ground was formerly extensively drifted. The present operators are working around the south-easterly limit of the old workings into virgin ground to the south-east and report an encouraging gold-recovery.

Lynx Lease. This ground is situated south of the easterly end of the first canyon and adjoins the *St. Quentin* on the south-east. The lease was taken over on a "lay" by the Columbia Development Company (A. R. Kaufman and associates, of Kitchener, Ontario), which installed a steam-shovel and mobile sluicing plant designed by D. Eastman. The shovel is equipped with a ½-cubic-yard dipper and the sluicing plant with a trestle incline and a 1½-cubic-yard-capacity dump-skip operated by a 15-horse-power LeRoy single-drum gasoline-hoist. Gasoline-consumption is 4 to 5 gallons per shift and wood-consumption for the shovel-boiler is about three-quarters of a cord per shift. An

average crew of nineteen is employed. At the time of examination the shovel was digging in a "gut" about 15 feet deep along the south rim of the old channel. The gravel sluiced is estimated to carry about 0.0322 oz. gold per cubic yard.

Hardscrabble Lease. This lease is located about 825 feet south-easterly from the *Lynx* lease, adjoins the *Baldwin* lease on the west, and is owned by J. Clay of Atlin. The creek-ground in this locality is about 12 feet deep to bed-rock and had been continuously worked by the owner up to 1936. For this operation the creek was turned and gravel from the pit was shovelled into skips hoisted by a water-wheel and high-line equipment. Drainage of the pit was assisted by a Chinese pump. Spring floods destroyed the pit and equipment. Near the south-east corner and adjacent to the *Pillar Fraction* two individuals are drifting and crosscutting under the south bench, adjacent to the *Gladstone* lease.

Gladstone Lease. This lease covers the location of the old channel under the high south bench about 2,700 feet south-easterly from the first canyon. At this point Spruce Creek crosses the site of the old channel diagonally from east to west. The ground is owned by Jack Tintinger, of Atlin, and was formerly extensively drifted by McCloskey and Foley. During the last three years Carl Lykkergaard, working on a "lay" from Tintinger, has penetrated a portion of the old workings from an incline shaft in the easterly half of the lease and carried out drifting in virgin ground on flat bed-rock along the southerly margin of the old workings about 900 feet into the bench. Good recoveries were made from this work up to the spring of 1936, when values began to diminish. Rather than risk his profits in further prospecting, the operator completed the sluicing of his tailings and relinquished the "lay." Of interest is the recovery of a nugget weighing 44 oz. 3 dwt. during the last period of drifting.

Peterboro Lease. This ground covers the location of the old channel under the high south bench, adjoining the *Gladstone* lease on the east. It has been extensively drifted at various times since the early days. At present Otto Miller is drifting southerly from a shaft inclined 20 degrees for 54 feet. His workings have penetrated and skirted old workings and have advanced into virgin ground with flat bed-rock about 600 feet into the bench.

Tax and Olalla Leases. These creek leases cover the north side of the old-channel ground adjacent to and north of the *Gladstone* and *Peterboro* bench leases and the south-easterly continuation adjacent to and north of the *Poker* bench lease. In former workings the *Tax* lease had been worked by hand-shovelling to bed-rock, with the exception of a strip 150 feet wide and 600 feet long in the central section. The *Olalla* lease, adjoining the *Tax* on its up-stream side, appears to be unworked ground. In 1933 the ground of both leases was drilled by A. R. Kaufman, of Kitchener, Ontario. In 1934 the Columbia Development Company, controlled by these interests, installed a Bucyrus-Erie caterpillar steam-shovel with a mobile sluicing plant designed by D. Eastman and J. Walsh. The shovel is equipped with a 7/10-cubic-yard-capacity dipper. A double-track incline extends from the washing plant to the pit and skips of 7/10-cubic-yard capacity are hoisted by a 35-horse-power double-drum gasoline-hoist, consuming 7 to 8 gallons per shift. Wood-consumption for the shovel-boiler is about 1 cord per shift. An average crew of about twenty-two is employed.

The operation has required the carrying of a drainage-cut from the down-stream end of the *Tax* lease and digging through the previously-worked sections of this ground. It is interesting to note that recoveries from this work have been satisfactory. By the end of July, 1936, the shovel had advanced to about 150 feet from the *Olalla* line. In this section the bed-rock is humpy, with a cut 32 feet deep to bed-rock along the north rim, bordered on the south by a hump about 20 feet high. The gravel sluiced is estimated to carry 0.0237 oz. gold per cubic yard.

Hope Fraction. This creek claim, located about 400 feet up-stream from the easterly boundary of the *Olalla* lease, is owned by L. Schulz, of Atlin, and is being worked by Axel Nelson on a "lay." A shaft is sunk 35 feet to bed-rock to connect with a bed-rock drain, preparatory to drifting on bed-rock under the creek. Previous work by the same operator in this ground showed good bed-rock values, but the ground proved excessively wet for drifting.

Poker Lease. This bench lease is owned by I. Matthews and covers the location of the old channel under the high south bench adjoining the *Olalla* creek lease on the south. Appreciable drifting has been carried out on this ground at various times. Drifting in recent years by I. Matthews has advanced about 500 feet into the hill on flat decomposed bed-rock, at which point bed-rock dipped southerly into the hill, indicating the possibility of a deeper channel lying southerly of the old channel now being worked. Bed-rock ground in these workings returns from about $1.50 to over $2.50 per cubic yard.

During 1936 John Huget and four partners were working on a "lay" from I. Matthews. Drifts from a 108-foot shaft inclined at 15 degrees extend 270 feet south-westerly into the hill, skirting old workings lying to the east. At the time of examination on July 9th an average of forty cars (½ yard) per day were being sluiced, averaging about $2 per car. A clean-up on July 9th returned 32 oz. gold from 250 cars, an estimated equivalent of about 2.5 oz. per "set" (40 square feet).

Joker and Croker Leases. These bench leases adjoin the *Poker* on the south-east and are owned by I. Matthews, of Atlin. The ground covers the location of the old channel under the south high bench up to the *Ajax* lease in the locality of Eureka Creek, where the old channel crosses Spruce Creek to the north bench. Appreciable drifting by the owner and "lay-men" has been carried on in this ground at various times, but an appreciable extent of favourable virgin ground still remains on these leases.

In the easterly half of the *Croker*, adjoining the *Joker* on the south-east, two main drifts, from vertical shafts 20 feet above the creek and 60 feet deep to bed-rock, extend respectively 450 and 510 feet southerly under the bench. The ground is being worked on a "lay" by Fred Oman and partners. In the present most southerly workings the ground is reported to average about 2 oz. to the "set."

Bratt, Morse & Co. This partnership is drifting in the old channel under Spruce Creek on the *Jimmy Hill* and *Edith Hill* claims, about 600 feet north-easterly from Eureka Creek. In this section the old channel narrows perceptibly to a width of about 325 feet between high rims. The best ground is about 30 feet wide along the centre line of the channel, the bottom of which is about 100 to 150 feet wide. Drifting is carried out from a shaft 73 feet deep to bed-rock, and has been extended about 800 feet up-stream to about 70 feet west of the *Chance* creek lease. The last 450 feet is reported to have returned an average of 10 oz. gold to the "set" (40 square feet) across a width of 30 feet. In places 20 oz. to the "set" is reported to have been recovered. Appreciable favourable ground still remains between the shaft and the easterly extremity of drifting, lateral to the present workings. The ground is drained by a bed-rock adit but is wet. At the close of the 1936 season this ground was taken over by the Colpe Mining Company, Limited, which is working the ground adjoining on the east.

Wolf Lease. This bench lease, adjoining the Bratt-Morse ground on the south, covers the south rim of the old channel and is being worked by Eric Backsten and partners on a "lay" at 300 feet south 75 degrees east from the Morse shaft. A shaft inclined at 60 to 79 degrees encounters gently-sloping rim-rock at a depth of 60 feet. A southerly drift for 135 feet encountered a rising high rim, striking south-easterly. Two short drifts easterly, at 54 feet from the shaft and parallel with the *Wolf* north boundary, showed a flatter rim condition. The best returns will be obtained by drifting easterly as close to the *Wolf* north boundary as possible.

Clydesdale Lease. This bench lease adjoins the Morse creek-ground and the *Chance* creek claim on the north. It adjoins the *Dorothy* bench lease on the east and the *Goodwill* bench lease on the west. The southerly section of the *Clydesdale* covers the north rim of the old channel, which strikes diagonally across the lease from about the south-west corner to about 360 feet northerly of the south-east corner. The ground is being worked by W. Buchanan from a vertical shaft 82 feet deep to bed-rock, located about 800 feet south-easterly of the Morse shaft. A crosscut to north-west encountered high rim about 160 feet from the shaft. Drifting up-stream, south-easterly, shows rim sloping about 5 degrees south-westerly towards the creek. Irregular values have been recovered along the rim-slope. As work proceeds up-stream towards the east boundary a greater width of the channel flat bed-rock should enter the property.

Colpe Mining Co., Ltd. This is a private company incorporated in British Columbia in May, 1935, with a capitalization of $50,000. The registered office is at 800 Hall Building, Vancouver. The holdings embrace the *Chance* creek lease, adjoining the Morse-Bratt ground on the east; the *Goodwill* bench lease adjoining the *Clydesdale* bench lease on the east; and the *Sunlight* creek claim, adjoining the *Goodwill* on the east. At the close of 1936 the company also acquired the Morse-Bratt creek-ground adjoining the *Chance* creek lease on the west. Previous to 1932 the ground had been worked in an unsystematic manner by "lay-men." Subsequent to that time the present interest entered the picture and commenced a systematic plan of operation.

The *Chance* creek lease covers the coincidence of the old channel with Spruce Creek, up-stream from the Morse-Bratt workings. South-easterly of this the *Goodwill* bench lease covers the up-stream continuation of the old channel under the high bench north of the second canyon to its repeated coincidence with, and crossing of, Spruce Creek in the *Sunlight* creek claim.

The workings consist of a vertical shaft, 93 feet deep, at the south rim-side of the old channel, on the north boundary of the easterly end of the *Chance* claim. From this a crosscut north-east for 300 feet extends to about the centre line of the old channel. Two main north and south drifts extend up-stream from the crosscut, to drainage and crosscut connections with a vertical shaft 203 feet deep on the south rim-side of the old channel in the south-westerly corner of the *Sunlight* creek claim and about 1,500 feet from the lower shaft. At the time of examination the workings had progressed about 300 feet up-stream (south-easterly) from the upper shaft. In the new workings of the upper-shaft section the main drifts are about 60 feet apart and the ground is blocked by crosscuts between and lateral to them. In the section of the old workings the drifts meander irregularly along the north and south sides of the channel and vary from 60 to over 200 feet apart, with irregular sectional and lateral cross-cutting. The workings are dewatered by drainage to pump-sumps at the shafts, but this would be greatly facilitated by a bed-rock drainage connection with the drainage system of the Morse-Bratt workings. The easterly section of the workings up-stream from the old "lay" workings are systematized into a series of blocks between the main north and south drifts. About 180 feet along the lower shaft crosscut, branch drifting and crosscutting extends 420 feet north along flat, decomposed bed-rock and encounters at this point a steep drop-off of bed-rock to the north which is probably a local gut or depression along the north rim in this locality.

At the time of examination (end of July) work was being carried on with a crew of sixty men. In the old workings about 1,000 feet of ground tributary to the lower shaft was in process of being "cleaned up." Mining in four faces in this section, mostly in marginal ground, at the rate of 6 "sets" per week, was being carried on with a reported recovery of 96 oz. from twenty-four "sets." Two places in this area are reported to have returned 48 oz. from 6 "sets."

In the new workings tributary to the upper shaft five faces were being worked at the rate of eighteen "sets" per week with a reported average recovery of 80 to 100 oz. from eighteen "sets." In this section the best values, averaging 4 to 5 oz. to the "set," occur across a width of 60 to 80 feet and the workings are carried to marginal ground running about 2 oz. to the "set." In some sections along the channel centre line values of 10 to 12 oz. to the "set" are reported. At the extreme easterly workings, flat, decomposed bed-rock of the old channel reported to carry the average cited values extends across a width of 138 feet.

In both the upper and lower shaft areas faces are carried about 6 feet high, including about 2 to 2½ feet in decomposed bed-rock. As the best values in the Spruce Creek old channel occur in and on top of bed-rock this is the general mining practice along the creek. At both the shafts test-sluices are maintained, and for the direction of the workings values are ascertained by sluicing a known number of cars from definite sections.

Dream Lease. This bench lease adjoins the *Sunlight*, a southerly fraction of the *Canyon* lease and the adjoining *New Year* lease on the south. It is owned by G. Nolan, of Atlin, who holds an option on the *New Year*. The ground covers the projected south-easterly extension from the *Sunlight* ground of the old channel under the south bench of Spruce Creek. In former years a shaft was sunk by Nolan in glacial drift in the south-westerly corner of the *Canyon* lease. This is filled with water, but is reported to have encountered rim-rock at a depth of 60 feet sloping steeply south.

Towards the close of the 1936 season a shaft was started at elevation 3,250 feet in the north-west corner of the *Dream* lease and about 850 feet easterly of the Colpe Mining Company's upper shaft on the *Sunlight*. Correlation with the extreme easterly workings on the *Sunlight* indicates the position of this shaft to be within the area of the projected up-stream continuation of the old channel, with bed-rock estimated to be at a depth of 218 feet. In the intervening stretch between this point and the Blue Canyon area no work is being or has been done along the projected course of the old channel. This is deep ground and values should be ascertained by drilling.

Blue Canyon.—In this section there are opportunities for shallow digging by individuals in post-Glacial wash-gravel overlying clay bed-rock, on low benches along Spruce Creek trough and on rim-rock in and above the canyon. Former and present individual shovelling-operations indicate a possible appreciable extent of fine gravel worthy of exploration for possible operation by steam-shovelling or dredging with modern dredge equipment.

On the north bank of Spruce Creek, about 1 mile above Rant Creek, A. T. Abbot has been shovelling shallow ground for several years from various places on a creek lease and claim. In 1936 he was shovelling fine top gravel in two places, 3 and 4 feet down from grass-roots, and recovering low values. In this section the creek-trough is 100 feet wide between moraine benches 30 feet high.

About three-quarters of a mile above Abbot's workings H. G. Marshall is shovelling-in from the creek-trough in pits and cuts 6 to 11 feet deep to hard-pan. It is of interest to note that this man has been shovelling-in this section continuously since 1900. The gold recovered is moderately fine and the ground is reported to seldom return below about 30 cents to the cubic yard. Two other individuals were working intermittently on shallow rim-ground in and above Blue Canyon.

SPECIAL REPORTS.

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

Bush Consolidated Gold Mines, Limited.
Pay Roll.
Parvati Group.

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

PROGRESS NOTES.

LODE-GOLD DEPOSITS.

BY

CHARLES GRAHAM.

COAST AREA.

Surf Point Mine.—Operated by N. A. Timmins Corporation, Limited; R. E. Legg, manager. The mine and mill operated continuously during the year. A second exit to the mine has been provided by driving a second level through to the outside. Ventilation is natural. The output from the mine is about 40 tons per day. This is put over a sorting-table, as it contains considerable waste, before being put through the mill, which has a capacity of about 23 tons per day.

Developments during the year consisted of 194 feet of drifting, 28 feet of crosscutting, 114 feet of raising, and 1,428 feet of diamond-drilling; 15,215 tons of ore was mined, and this yielded 3,374 oz. gold and 1,219 oz. silver.

Edye Pass Mine.—Operated by the Reward Mining Company, Limited; Alex. Smith, manager. Active development-work has been carried out since the property was acquired in May. The property adjoins the *Surf Point* mine. An adit has been commenced about 150 feet above sea-level and close to the shore-line. This has been driven in approximately 500 feet,

ATLIN PLACERS LTD.
(Non Personal Liability)

Incorporated (1940) under the laws of
The Province of British Columbia
Canada

Atlin Placers Ltd., 90% of which is owned by the Walter W. Johnson Company, acquired in 1939, from the Compagnie Franchaise des Mines d/Or du Canada, Societe Anonyse (a French controlled company), a lease and option on 4 miles of Otter Creek, located 10 miles east of Atlin, British Columbia, a mining town 130 miles southwest of Whitehorse, Yukon Territory. A good gravel road connects Whitehorse, Atlin and Otter Creek. The road is maintained by the Yukon Territory and British Columbia governments. This road is open throughout the year.

Planes leave Seattle, or Vancouver, around 8:00 A.M. and arrive in Whitehorse at noon. Travel to Atlin is 3-1/2 hours by automobile or less than one hour by commercial airplane. Freight is shipped by steamer or barges to Skagway or Haines, Alaska, then transported by trucks from Haines or by railroad from Skagway to Whitehorse, then by truck to the property.

OTTER CREEK

Five percent royalty is to be paid on the gross gold production until the French Company receives $375,000.00. Fifteen thousand dollars, of the royalty, was paid at the time the option and lease were obtained. An additional $3,500.00 was paid to the French Company at a later date.

The Walter W. Johnson Company and Atlin Placers Ltd., have expended, since 1939, approximately $360,000.00, exclusive of engineering and overhead costs, in prospecting and acquiring leases, mainly on Otter, Pine and Wright Creeks which are located in the Atlin Placer District, Atlin, British Columbia.

Results of this program indicate that Otter and Pine Creeks can be combined into a single attractive Gold Dredging Operation. Wright Creek, with about $1,000,000 blocked out to date, is currently not being considered due to it's being a small and completely separate operation.

The French Company, from the late 1920's to 1932, hydrauliced approximately two million yards of glacial till on Otter Creek. This glacial till, consisting mostly of fine and medium size gravel, overlies the Otter Creek deep channel gravels for the first three miles of the Creek with an average depth of 80'. The channel is not completely covered with this till, for aside from the French Company's hydraulicing operation, the Creek's normal flow of water has washed out a considerable amount of this overburden.

The French Company's hydraulicing operation produced an average of 10¢ per cubic yard at the old gold price of $20.67 per ounce and 16.9¢ per cubic yard at the gold price of $35.00 per ounce. Our samplings of the till showed an average of 15.7¢ per cubic yard. Of the 4,000,000 yards remaining to be mined, we have used an average recoverable value of 15¢ per cubic yard at the gold price of $35.00 per ounce.

The hydraulicing operation, of the French Company, on the lower end of Otter Creek, exposed some of the surface gravels of the deep Otter Creek Channel, whose exact location was not previously known. After discovery of the channel, and the indication of the gold values in it's gravels, an inclined shaft was sunk through 85' of gravel to bedrock. Sinking of the shaft revealed gold values from the surface to bedrock, with three intermediate levels, each with a gold content of over $11.00 per cubic yard. The top level is the Moran, the second is the Strand and the bottom level is the Bedrock. The latter two levels were drift mined for a height of 7' and for a distance of 900'. The Moran level was drift mined for a height of 7' and for a distance of about 400'. These three levels were but partially mined, by a crew of five men, using hand methods, however, approximately $200,000.00 (at the gold price of $35.00 per ounce) was produced between 1932 and 1939.

Our sampling, underground, in 1939, shows over $700,000.00 remaining in this section. It is questionable if the Moran level continues upstream or if the values originated from a high level bench, on the right limit and since eroded. Coarse gold and nuggets, worth up to $50.00 were removed from the Moran level.

The lower two-tenths of a mile, above line five, on Otter Creek, has been prospected by one line of five 6" drill holes, 300' below the drifted area and by 35 underground samples, most of which were from one to ten cubic yards in content, taken from the 900 feet of the partially drifted area.

Upstream, from the drifted section, 2.6 miles of the channel has been prospected. One shaft, costing over $10,000.00 was sunk 110' from surface to bedrock. Two shafts were sunk 32' but were stopped by heavy flow of water. Thirty-nine drill holes, using 5" and 6" churn drills were also put down. Colors from two of the underground cuts averaged 4.45 mgms. whereas the average weight of colors from two of the best drill holes in the same area was 2.52 mgms. As the gold in Otter Creek is unusually coarse, it is an accepted fact that a gold dredge will recover at least 100% over the values, per cubic yard, shown by the drill hole samplings.

Prospecting by Atlin Placers Ltd., from 1939 to date, on the lower 2.8 miles of Otter Creek, indicates a recovery of $5,206,080.00 (at the gold price of $35.00 per ounce) from 8,976,000 cubic yards of channel gravel averaging 58¢ per cubic yard and $600,000.00 from the glacial till of 4,000,000 yards, averaging 15¢ per cubic yard.

Otter Creek will be mined by a 12 cubic foot gold dredge, with a capacity of 9,000 yards per day, a digging depth of 75' below surface and washes and stacks a bank 60' above water. A 5 cubic yard dragline will be employed to increase the height of stacking the tailings when necessary.

On Otter Creek, 28% of the gold weighs in excess of 8¢ per color. Nuggets with a value of up to $1,200.00 have been found in every creek that drains into Pine Creek, downstream from Ruby Creek.

On Caribou Creek, in the Fairbanks District of Alaska, the Walter W. Johnson Company owned and operated a gold dredging property where on the upper section of the creek, the values overran the drill holes by 300% due to the coarse gold in the gravel.

OTTER CREEK:

Gold recovery based on the gold price of $35.00 per ounce. (Overrun not included.)

Channel gravel - 8,976,000 cubic yards @ 58¢		$5,206,080
Glacial till - 4,000,000 cubic yards @ 15¢ (165,888 oz)		600,000
		$5,806,080
Royalty @ 5%		260,304
Operating Costs - 12,976,000 cu. yds. @ 21.4¢		2,776,864
Moving of dredge from Pine to Otter Creek		200,000
Purchase of hydraulic equipment for dredge and 5 cubic yard dragline		85,000
		$3,322,168
Profit before return of capital investment		$2,483,912

The following figures show an indicated 100% recovery on Otter Creek:

Otter Creek - 165,888 ozs. @ $35.00/oz.	$5,806,080
Otter Creek - 165,888 ozs. of gold (100% additional recovery @ $35.00/oz. less $600,000 from glacial till) (till contains fine gold)	5,206,080
Total ounces, 331,776	$11,012,160

1899 - ...ptics into the south side of Surprise Lake. No work to speak of, has been done below the Upper Canyon, as the bedrock is too deep. Above the Upper Canuon, fairly good pay dirt has been obtained and plenty of work done. Several leases, both bench and creek, have been granted on this creek.

1900 - A little work has been done on this creek by individual placer miners only, consequently the results are small. However, many leases have been taken up and condiderable prospecting done, with a view to locating pay gravel. It is reported that considerable work will be done on this creek next season by various companies. 122 ounces gold taken.

1901 - No placer miners have worked on this creek during the past season. Messrs. Moran and Carmichael are operating some leases on the upper portion of the creek and the following is the report of their operations:- During the summer a ditch was constructed fourteen hundred feet in length and twenty-two hundred cubic yards of gravel, which paid well, were washed. It is intended to further prospect the ground to locate the pay gravel.

1902 - On Otter creek no work was done below the second canyon, but above this Messrs. Carmichael and Moran who, with their friends, have acquired a considerable area, with commendable persistance prospected the ground last winter by drifting in several directions, and with very excellent results. A stratum of gravel was found under the silt which had been formerly accepted as bedrock. Four men were employed all the summer and a small prospecting plant installed, lumber and supplies being taken in with pack horses. About 2,500 yards were washed, with such promising results that a local syndicate has been formed to work the property extensively. The plant of the Pendugwig Hydraulic Mining Company, on Wright Creek, has been purchased by the syndicate and is being moved to Otter creek. Houses and stables have been erected, waggon roads built and all arrangements perfected to have the large plant in operation by May, 1903. From 15 to 20 men are at present working on the ground. Prospecting showed this gravel to average $1 per cubic yard.

The lower part of this creek, for five or six miles, has been held under leases, but, the conditions not having been complied with, these were cancelled. The ground has, however, been to a considerable extent re-located in leases, and will be prospected as a dredging proposition in the near future. 170 oz.

1903 - On Otter creek, the Otter Creek Hydraulic Company, Limited, under the management of Mr. J.H.Brownlee, P.L.S., installed a hydraulic plant and did considerable dead work, but owing to the supply of water failing early in the season no large returns were secured. I regret to say that the manager neglected to supply me with data from which to give a more extended notice of the property and operations. (report since found and following extracts made)- 'This company has acquired Messrs. Carmichael & Moran's lease on Otter creek, consisting of 3 miles of the upper portion of the creek and the contiguous benches. The property has been successfully prospected by the former owners with excellent results, No. 1 & 2 pits being opened up. The plant installed by the present company during 1903 may be summarised briefly as follows:- "Five

1903 - contd - "thousand feet of supply flume, carrying a maximum flow of 1,000 inches of water, the supply pipe consisting of 2,000 feet of 12, 14 and 16 inch double rivetted No. 14 gauge; intake pipe, 28 inches, connecting with pressure box with sand tank, etc., all on solid gravel foundation, 246 feet above present workings; three No. 4 monitors with Hoskind deflectord; bywash consisting of 1,500 feet of ditch and 400 feet of double 12 inch pipe-line. The bed-rock flume, 30 inches wide and 40 feet long, has been extended 150 feet. There is a full equipment of tools, blacksmith's supplies, etc. and a commodious dining-room, bunk-house, cook-house, foreman's cabin, blacksmith shop, tool-house, powder-house, stable and other buildings have been erected.

"Development began on July 1st. 1903, an opening being made 1,000 feet below No.1 Pit; the rim was blasted out and the old channel, prospected by the former owners, was reached just as water gave out. A tunnel was also driven across the channel, which is 80 feet wide with a 4-foot pay-streak and a splendid bedrock grade up stream, with satisfactory results, and every-thing is in readiness for beginning work in 1904. Surveys have also been made for sonserving dams." "The company has also acquired 160 acres of bench ground below the present workings, which it is intended to prospect with Keystone drill. The principal owners (Mr.Switzer and associates) also have a lease of three miles of Flat creek ground which it is proposed to dredge." "The company is in good financial condition and the outlook is most encouraging". 28 oz. of gold taken.

1904 - On this creek the Otter Creek Hydraulic Company, Limited, did considerable work on the leases held under bond from Messrs. Carmichael, Moran et al, but early in the season closed down, with, I understand, the intention of abandoning any further claim under the bond. The owners are still confident as to the value of their property, and claim that is is quite capable of profitable operation by properly utilising the available supply of water, the scarcity of which is the greatest difficulty.

1905 - Beyond the operations of four of five men prospecting a group of leases near its mouth, nothing was done on this creek during the summer, but Mr. Carmichael is on it this winter preparing for extensive operations next season on the group of leases on Upper Otter held by himself and partners, which have recently been re-conveyed to them by the Otter Hydraulic Co., which failed to perform its part under the bond held on the properties.

1906 - On this creek we have another evidence of plucky perseverance and faith in the ground which, I am glad to say, promises to be well rewarded. I refer to the operations of Messrs. Carmichael & Co., who own the Otter Creek Consolidated Group of hydraulic leases, situated on upper Otter creek, acquired and for a time held by the "Otter Hydraulic Co. Ltd." and reconveyed last year to Messrs. Carmichael and partners, the original owners. These operators commenced in April to move the plant, pipe lines, etc, and did a large amount of dead work, including the laying and riffling of 240 feet(lineal) of sluce flume, 2' by 3' and laying a long lenght of supply pipe. They commenced piping on May 22, and between then and the 10th of Oct., when their sluices froze up, with an average force of 5 men and a very limited supply of water, they washed down 26,000 cu. yds. of barren dirt and over 10,000 cu. yds. of "pay gravel" from which they obtained, approx. $4,000 worth of gold. They have left their plant and pits in excellent shape for an early start and successful operations next season. The banks

On lower Otter Creek, the Maluin Syndicate (which in last years report was designated the 'Otter Creek Hydraulic Gold Mining Co.') brought in a hydraulic plant over the ice and commenced installation work about the 1st. of May, had it installed and water turned on in 2 No.4 giants with 6" nozzles on May 26th and throwing a stream estimated at 1,200 miners inches under 150' pressure. With an average force of 8 men, they operated until Oct. 15th during which time they moved about 112,000 cu. yds. of material cutting through the northern bank of Otter Creek, where at one point it was 103 feet deep, so as to gain access to Surprise Lake for dumping purposes. They laid about 1050 feet of Flume 40" x 40", paved with 8" x 8" x 8" riffle blocks, which is laid on a 3% grade, and when operations were suspended the outer end had an elevation of 53 feet above Surprise Lake, and the inner pit end was 25' velow the surface of the creek bed but still not on bedrock. With a view to prospecting the ground and ascertaining where bedrock is, they commenced a shaft in the pit near the upper end of the flume, and with a steam pump and hoist are sinking and drifting from that point. They have also built another storage dam, half-way up the valley (say 2½ - 3 mi.) which is 250' long and 16' high, with provision for raising it to 20'. It is well constructed and provided with spillway etc, to accomodate surplus water. The installation of the plant and the constructions of this dam was superintended by W.H.Brethour of Victoria. Should the pay in the gravel on this property prove as good as the prospects indicate, this syndicate, which controls 11 leases, will be found to possess a very valuable property.
Gold reported 1908 - Companies 269 oz., $4,160.00 value, $40.00 royalty

1909 - Otter Creek - On the upper portion of this creek the Otter Creek Development Co. under the management of J.E.Moran, operated with 6 men fro the first 2 months and with 5 for the rest of the season. There was uncovered about 3000 sq. yeds of bedrock and about 54,000 cu. yds. of gravel were moved, working against a face of about 50' in height. The gravel appears to be well charged with gold, but, unfortunately, the early cold snap prevented the cleaning up of bedrock, so that the full results of the seasons operations are unknown. The gold will all be recovered early next season.

On the lower part of Otter Creek the Maluin Syndicate continued piping to reach bedrock, but had not quite succeeded when the first cold snap compelled it to close down. The operations, which were carried on under the superintendence of W.H.Brethour, were commenced on May 10th and closed down about October 20th. The company began the season by enlarging the supply ditch, moving the pressure-box about 1,000 gt. upstream, and repairing damage caused by the bursting of a reservoir near the head of the creek. Piping with 2 No. 4 giants with 6" nozzles was carried on from June 7th until Oct. 20 but as the piping was against a bank, of about 140' in height, progress was not rapid although a large amount of material was moved.

During the season a storage dam, partly built last season about half-way up the valley, was completed and utilised, with very satisfactory results. During the season's operations the present creek-bed, or channel, was piped into the sluice and a fair amount of gold recovered, but what they are seeking is the old channel which appears to lie beneath this immense bank of gravel, the removal of which it fortunately possess or can procure. The company is sanguine of reaching bedrock early in [illegible] anticipations of rich pay

1906 - cont'd.

on which they operated average about 18' in height with from 8 - 12 feet of pay gravel, yielding from $2.34 to $3.46 per sq. yd. of bedrock and over 50 cents per cubic yard. This property is now owned by a small "close" corporation which has several leases of apparently good ground, and a plant is installed consisting of about one mile (5,240 feet) of supply flume, 20 inches by 30 inches, 3,600 feet of steel pipe lines, 600 feet of sluice flume, two No. 3 Giants, the usual supply of mining tools, blacksmith shop and outfit, and very comfortable dwelling house, cabins and barn. I believe it is intended to establish a system of reservoirs next season, for which the physical conditions are said to be favorable, so that very good results may be expected from future operations.

Another group of leases on lower Otter is held under bond by Messrs. Malvin, Jamieson & Co., who did considerable prospecting on them last season, with, I believe, very encouraging results, and I understand all preliminary arrangements have been made for the installation of an hydraulic plant next year.
Gold recovered - Companies 255 oz., $3,952.00 value, $39.05 royalty

1907 - Otter Creek - On this creek Messrs. Carmichael, Moran and Company(the Otter Creek Development Company) who own the Otter Creek Consolidated group of hydraulic leases, situated on upper Otter creek, worked with a force of 5 men throughout the season, and were again rewarded by very fair returns. They commenced operations on April 25th and continued until October 21st while active piping was carried on from May 25th to Oct. 15th. During this period they moved about 20,000 cu.yds. of gravel, uncovering over 2,000 sq. yes. of bedrock from which they recovered gold averaging upwards of $2.50 per sq. yd. of bedrock. They also constructed dams for the conservation of water and performed other dead-work which is calculated to enable them to make a much improved showing next season.

On lower Otter creek the Otter Creek Hydraulic Gold Mining Company, which controls a group of 11 leases, under the superintendence of Mr. M.R.Jamieson, had a crew of from four to eight men employed from June 1st. to October 15th. preparing for the installation of hydraulic plant, in the course of which was constructed about 2,100 feet of ditch and flume 4' x 3½' with necessary head dams, etc. and a larger dam on the "divide" between Otter and Spruce Creekd, thus establishing a reservoir capable of conserving a large quantity of water. Everything is in readiness for the installation next spring of a hydraulic plant, with which to at once commence operations and be able to make a fair showing before the end of the season.
Gold recovered - Companies 345 oz., $5,347.50 value, $66.95 royalty

1908 - Otter Creek - On the upper portion of this creek the Otter Creek Development Co. under the management of Mr. J.E.Moran, operated with 6 men, and, not withstanding shortage of water, moved 30,000 cu. yds. of gravel, built 2 nes storage dams, etc., and I understand are in good shape for next season's work.

1910 - Otter Creek - On the upper portion of this creek the Otter Creek Development Co. under the superintendence of J.E.Moran operated from the 28th of April until Oct. 17th with a force of 4 men, and during that period moved about 30,000 cu. yds. of gravel and uncovered about 1000 sq. yds. of bed-rock. The results were rather disappointing, the expectations expressed at the close of the previous season not being realized.

On the lower part of Otter Creek the Maluin Syndicate with a force of from 8 to 18 men - an average of 14 - under the superintendence of W.H.Brethour, continued to search for bedrock, in the prosecution of which a large amount of overburden (over 250,000 cu. yds) was moved, but owing to a succession of unfortunate accidents, the hydraulic operations were suspended about the 1st. of August and the desired goal was not reached. This outfit commenced operations on the 8th of May and things were going along satisfactorily until June 29th when a reservoir dam, situated about 3 mi. upstream collapsed and the consequent rush of water destroyed the intake and a portion of the supply ditch carrying away about 600 ft.(lineal) of the lower end of the sluice boxes and filling pits with debris many feet deep. About the end of July another reservoir dam located about 5 mi. upstream, gave way and with it all the reserve water was lost, and so hydraluic operations were compelled to cease. For the balance of the season all energies and resources were directed to repairing and rebuilding the ditch, dams and flumes, diggign other ditches, sinking and driving prospecting shafts and tunnels etc. until, finally, they were c compelled to close down because the pumps used in the prospecting dhaft were unable to control and dispose of the inflow of water. Operations are expected to commence very early next season, with the hope of reaching bed-rock and washing considerable pay-gravel before the close of the season.

1911 - Otter Creek - On the upper portion of this creek the Otter Creek Development Co. under the management of J.E.Moran, with a force of 5 men, commenced operations on May 1st. and continued until Oct. 25th.

About 40,000 cu. yds of gravel, from banks about 30' in height, was washed down hydraulickally, and, although the returns were a little better than those of the previous season, they were still rather disappointing.

On the lower part of Otter Creek the Maluin Syndicate with W.H.Brethour as manager, with a force of from 5 to 15 men(with an average of 7), commenced operations on April 6th and continued until Oct. 2nd. Prospecting, by means of shafts as during the previous season, was continued for a short time and them abandoned for a Keystone driller, with which 21 holes were sunk to bedrock at alternate cross sections on the creek, the results from which w were very encouraging; in fact, I believe that in no instance did they fail to find gold where bedrock was reached; the average depth of the channel was found to be about 44'.

Hydraulic operations were prosecuted from August 2 - Sept.30 and a large quantity of overburden disposed of.

A new ditch, about 8000' farther up than the present working ditch, was commenced and partially constructed; when completed it is expected to supply water at a vertical head of 299 feet.

1911 contd. Otter Creek

An additional supply of hydraulic pipe, aggregating 5,300' in length and averaging 30" in diameter, is expected in upon the opening of navigation, so that good results may be expected during the next season.

1912 - Otter Creek - On the upper portion of this creek J.E.Moran with a force of 4 men commenced operations on April 25th but woing to the scarcity of water only 3 men were working during the latter part of the season. The returns were about the same as in former seasons in proportion to the amount of gravel moved, and over $1 per sq. yd. of bed-rock uncovered was secured. The banks were about 30' deep. Operations were closed down Oct. 28th.

On the lower part of Otter Creek the Maluin Syndicate, under the management of W.H.Brethour, continued the development work commenced 2 years ago, and, with a considerable force, running from 10 - 30 men, was engaged throughout the season installing pipe-lines and hydraulicking out a foundation for ditch and pipe-line and to reach bedrock. During the season nearly 6,000 feet of new hydraulic pipe running from 16 - 32" diameter, was installed at a cost of nearly $16,000 and altogether an expenditure of about $35,000 was reported in addition to that reported for previous seasons. This installations, when completed will be extensive and well equipped, and will doubtless give a good account of itself when mining is once more permanently undertaken.

1913 - Report made by Atlin Gold Commissioner to Victoria

OTTER CREEK - On upper Otter creek J.E.Moran assisted by three others, operated throughout the season, and when overtaken by the early freeze-up, was compelled to leave the greater part of the resluts of his last pit unrecovered, and will therefore have an easy clean-up to commence with in the spring; results secured, however, even as it was, were better than for the previous year. A new dam was built during the season which will enhance the efficiency of the water supply.

On lower Otter creek the Maluin Syndicate, under the management of W.H.Brethour and the general superintendence of Henry Maluin, with an average of twelve men, continued working down towards bed-rock, as in former seasons, commencing May 15th and closing down on October 20th. During that period of operation about 150,000 cubic years of earth and gravel is reported as having been moved, besides making a sluiceway through rock for about 400 feet, with an average depth of 8 feet. This heavy "dead-work" has been rendered necessary in order to follow the "pay" which a Keystone drill and other prospects-work had disclosed as swinging out of the creek and under a high bank of gravel. It is expected that "pay" on bed-rock will be reached next summer. This work is being done by water, under pressure, and the debris is carried down towards Surprise Lake, which provides excellent dump-room.

Other work done during the season comprised the laying of 900 feet additional flume, moving camp buildings, re-enforcing dams, etc.

1914 - On upper Otter creek J.E.Moran assisted by three owners, [illegible] throughout the season, and when overtaken by the early freeze-up, was compelled to leave the greater part of the results of his last pit unrecovered, and will therefore have an easy clean-up to commence with in the spring; results secured, however, even as it was, were better than for the previous year. A new dam was built during the season which will enhance the efficency of the water.

On lower Otter creek the Haluin Syndicate, under the management of W.H.Brethour and the general superintendence of Henry Haluin, with an average of twelve men, continued working down towards bed-rock, as in former seasons, commencing May 15th and closing down on October 20th. During that period of operation about 150,000 cubic yards of earth and gravel is reported as having been moved, besides making a sluiceway through rock for about 400 feet, with an average depth of 8 feet. This heavy "dead-work" has been rendered necessary in order to follow the "pay" which a Keystone drill and other prospect-work has disclosed as swinging out of the creek and under a high bank of gravel. It is expecyed that "pay" on bed-rock will be reached next summer. This work is being done by water, under pressure, and the debris is carried down towards Surprise lake, which provides excellent dump-room.

Other work done during the season comprised the laying of 900 feet additional flume, moving camp buildings, re-enforcing dams, etc.

215 - On upper Otter creek J.E.Moran continued his sluicing operations, and with a force of five men on an average moved about 20,000 cubic yards of gravel and uncovered over 10,000 square feet of bed-rock. The results were rather disappointing, but by accident "pay" was discovered during the season on higher ground that was being worked and where it was not anticipated, and it is Mr.Moran's intention to devote his attention to the operations of this ground during the coming season.

During the season a dam about 120 feet in lenght and about 10 feet in height was built to assist in the manipulation of the water-supply.

Operations were commenced on April 25th and piping on May 13 and continued until October 20th, when the approach of winter compelled them to close down and move to a lower altitude.

On lower Otter creek the Mines d'Otter, under the superintendence of W.H.Brethour and the general management of Henry Malvin, continued advancing its sluce-boxes up-stream about 750 feet and its flumes down-stream for dump purposes, and in so doing sut through banks averaging about 60 feet in height and moved approximately 150,000 cubic yards of material, but the season closed upon them before they had quite got the upper end on to bed-rock. Towards the end of the season, however, a prospect-hole was sunk in the pit which revealed bed-rock and good pay at a very short distance below the grade of the sluice-boxes, so that it is confidently anticipated by the management that they can operate on bed-rock and in good pay-gravel-for the greater part of next season, and so begin to recoup themselves for their heavy outlay.

Other work done during the season was the building of a by-wash, deepening ditches and strengthening dams, of which they have three, sawing riffle-blocks, and building about a mile of wagon-road from the Government wagon-road to the actual seat of main operations.

This outfit has now in operation about 9,500 feet of supply-ditches, three good dams and reservoirs and a long line of flumes and sluces, a sawmill and other plant, all of which, with the labour expended, represents an investment of many thousands of dollars, and it is gratifying to learn that bed-rock is so nearly accessible and that the "pay" is there.

As those operations were dependent upon French(Parisian) capital, I regret to say that they have been somewhat hampered in consequence of the war, but they have never actually been suspended as yet.

A force comprising an average of nine men was employed during the season of 1915, which covered the period from May 3rd to October 28th. Drifting operations were carried on last winter and again this winter-prospecting-and about ten men are thus engaged.

Declaration of Work by H. Maluin - 1919

The group of Lower Otter Creek - Mines d'Otter Creek Oct. 1919. (Vinci, Otter, Louise, Crown, Bear, Lynx, Fox, Paris, Melborne, Marheer, London)

Work was mainly performed on the Bear Creek Lease and consisted of prepatory work in the spring, running sawmill, setting pipelines and monitors, cleaning ditches and flumes, strengthening dams etc. such work lasting from April 25 to May 15th and then the usual hydraulic operations during which about 200,000 yds of overburden and gravel were removed. The last piping was done on Oct. 17th. The number of men averaged 9 with an approx. payroll of $9000. Total wxpenses amounted to about 16,000 - including explosives, horse and teaming, logging contracts, manager expenses, government fees, tools and supplies, lumber etc. An average of about 300 feet upstream was made without encountering the bedrock which however seems to crop up in the right corner of the last pit. Some gold but not in paying quantity, was encountered, as during the last 4 seasons, upon a false bedrock of hard clay. The depth of gouund removed varied from 60 to 120 feet.

Report to Victoria for 1918 by Atlin Gold Commissionor.

OTTER CREEK: The Mines D'Otter Creek, sup. J.E.Moran and general manegment of H.Maluin commenced operations on March 15 and with a force varying from a minimum of 4 to a maximum of 10 and an average of 6 carried on until the end of October. During that period about 1200' of new sluice flume was built and the sluice blocks renewed in the 3500' of sluice previously in use. About 200,000 cu. yds. of gravel were removed and about 40,000' of a hardpan bedrock which underlies the gravel in that portion of the valley was uncovered but the genuine bedrock was not reached and the operators were constrained to believe that it lies at a greater depth and below sluicing(hydraulic) grade and unfortunately the 'hardpan' was not found to carry gold in paying quantities which was disappointing as indications at the close of the previous Seasons operations led the operators to believe that at last they were on 'bedrock' and that thenceforth they would have plain sailing with profitable returns.

There was exceptionally high water on this creek early in the season which threatened great damage and which was only averted by strenuous effort but after that passes there was rather a scarcity of water as there was very little rainfall in the locality.

An experiment was made during the season which it is hped may, to some extent solve the formidable cost of riffling and maintaining long lines of sluices. This was the riffling of the sluice with heavy flat rocks held in place by sandboards and relieved by alternate rows of wooden (riffle) blocks.

The experiment is reported to have been quite a success and leads those operators to believe that is will be of material value to them.

Some years ago manganese steel plates were introduced here and worked very well but even they will wear out and the price of iron has advanced to such an extent that a satisfactory substitute will be hailed with delight by hydraulic miners.

Some drifting is being done this winter for the purpose of, if possible, locating genuine bedrock and better 'pay' and if they are successful in so doing, operations will continue next season providing sufficient satisfactory labor can be secured but if better 'pay' is not thus located it is probable those operatoons will be discontinued until conditions improve.

The average wage paid during last season was $7.00 a day and this, taken in conjunction with the high cost of everything else, constrains those operators to believe that they will be justified in awaiting the return of more favorable conditions.

A fair amount of gold was won during the season but not sufficient to cover expenses.

Nothing worth mentioning was done on uppper Otter this season.

Jan.15,1920 - brief report to Victoria covering 1919 seaonn

OTTER CREEK - On Otter Creek about the same force of men as in former Seasons continued throughout the Season, but unfortunately did not reach the genuine bedrock which they so confidently expected to at the begining of the Season. This outfit has been wrestling with these conditions for about 10 years. every year expecting to make the bedrock and just securing sufficient gold above bedrock to encourage them to continue in the hope of realizing fair returns when bedrock is reached but is is disappointing to them and to all concerned and incidentally unfortunate for the District that their search is being prolonged so disappointingly.

1919 gold output - Otter Creek $5440

1919 Season - Otter Creek / the Mines D'Otter with Mr. J.E.Moran as Foreman and H.Maluin as General Manager commenced operations May 1 and continued until the 1st of November and expended about $6000.00 in a continued effort to hydraulic their way down to the solid bedrock upon which the pay-gravel lies from which they expect to be recouped for all their outlay and to secure a substantial profit as well.

This Season's operations were mstly confined to widening the channel paralleling last Season's operations in order to determine its full width and also to recover the gold known to exist in the gravel over-lying a stratum of hardpan which acted as a sort of false bedrock and from which a certain quantity of gold has always been recoverable. The width of the channel was found to be a little under 200 feet.

In widening this channel it was necessary to remove an overburden about 140 feet in depth and in doing so a considerable deposit of glacial mud and clay was encountered which was absolutely barren but which it was deemed necessary to remove to attain the desired information and results. About 220,000 cubic yards of material were thus removed to get down to the gravel.

A comparatively small quantity of gold was recovered this year and consequently a deficit of nearly $10,000.00 was experienced but they had the satisfaction of finding an increasing quantity of gold near the upper end of their pit, which appeared to increase as they advanced, and also to find the hardpan bedrock (so called) giving place to hard (genuine) bed-rock and the apparent association of the increasing quantity of gold with the appearance of the hard (genuine) bed-rock encourages the hope and belief that next season will see them properly installed at last upon the real bed-rock of the Creek and that they may find thereon the rich pay which is confidently believed to exist there on.

Other work undertaken during the Season consisted in part of the repairing and re-riffling of about 2500 feet(lineal) of sluice flume; the dismantling, removing and relaying of about 1000 ft. of Pipe line, extending the "Wright" Creek water supply ditch about 1200 ft. strengthening the reservoir dam on the "Paris" lease etc.

The force employed throughout the Season varied from 6 to 10 men with an average of 8 men and the wages paid were on a basis of $7.00 per day.

This Company certainly deserves success and encouragement for its tenacity and manifest faith in the potentialities of the Creek and it is to be hoped next season will afford it the relief and reward it anticipations.

Nothing beyond a little 'sniping' was done on Upper Otter this

Gold output 1920 - Otter Creek Individuals $500.00
Companies $10,100.00

Dec.4, 1920 report to Victoria by Atlin Government Agent

OTTER CREEK: the Mines d'Otter Creek commenced operations on the 25th of April cleaning up ditches, flumes etc and operating until Oct. 17th with an average of 9 men and altogether expended about $16,000 and only recovered about $10,100.00. This gold which was recovered was lying upon false bedrock of hard clay but towards the end of the Season they encountered what appeared to be real bedrock in one corner of their pit and notwithstanding a number of just such experiences they intend to continue next season in the hope of recovering gold in paying quantities there from.

2 or 3 men were operating on Upper Otter Creek part of the Season but I have no return of the output which however I believe did not amount to very much so that I have placed the output from that Creek at $10,600.00 although I believe it would run over $11,000.00

Dec. 9/1921 - Otter approx. $14,500.00 Struck new paystreak

Dec. 15, 1921 - Government report - placer output Otter - $12,500.00

Dec. 30, 1921 - letter from Atlin Gold Commissioner to Victoria.

OTTER CREEK - On lower Otter the Mines d'Otter Creek under the Supertendince of Mr. Henri Maulin with Mr. J.E.Moran as foreman commenced operations on the 25th of April and continued until the end of Oct. during which period they advanced their sluices upstream about 250 feet and moved about 200,000 cu. yds of material but have not yet reached bedrock for which they are searching. This season operations uncovered about 40,000 sq.' of a hardpan 'bedrock', such has been described in previous reports but no satisfactory amount of gold was found thereon. Near the close of the season however, a discovery of a stratum or deposit of really good 'pay' gravel on a somewhat high rim increased the Seasons output very materially - exceeding last years output by from 20 to 25% and encouraging the belief that good pay may be recovered from rather high levels in the benches as well as from bedrock when they reach it. A few men are 'drift' mining there this winter.

Oct. 10, 1921 from H.Maluin - Mines D'Otter Creek
Otter Creek gold recovered

	4500
	2000
	2100
	8600 up to Oct.14, 1921
	3500
	12,100

Grouping of leases on Otter Creek(report submitted by H.Maluin)
2 - Paris; 36 - Marten; 362 - Lynx; 363 - Bear; 381-Fox; 404-Crown; 548-City of Paris on Wright Creek

Work on Bear and Lynx. Fifteen thousand since 20 day of April 1921 until end of Oct. 1921.

Usual hydraulic operations from 25 April to end of Oct. with an average number of 8 men per day - payroll totalling about $10,000. About 200,000 yds. of material were removed and about 40,000 sq. ft. uncovered. Most of that surface was the hardpan already described and poor about ½ of the surface was rim work and the values there were a little higher - Bedrock was not reached.

Sluices were advanced about 250' upstream. The cost of operations seems to exceed the gold recovered by several thousands dollars. Last clean up not made yet at this date (Oct.10, 1921) Balance of expenses cover: Dynamite, lumber, horse hire, teaming, Mgr. salary and expenses, govt. rentals, provisions, tools etc. Late season better ground was uncovered on the rim of the left limit and outlook is more encouraging.

OTTER CREEK

1922 - On lower Otter creek the Mines d'Or, Ltd., under the superintendence of Henri Malvin, with J.M.Horan as foreman, commenced operations on April 29th and continued until the end of October, during which period they advanced their sluices up-stream about 250 feet and moved about 200,000 cubic yards of material, but have not yet reached bed-rock, for which they are searching. This season's operations uncovered about 40,000 square feet of a hard-pan bed-rock, such as had been described in previous reports, but no satisfactory amount of gold was found thereon. Near the close of the season, however, a discovery of a stratum or deposit of really good pay-gravel on a somewhat high rim increased the season's output very materially, exceeding last year's output by from 20 to 25 per cent., and encouraging the belief that good "pay" may be recovered from rather high levels in the benches, as well as from bed-rock when they reach it. A few men are drift-mining there this winter.

Oct. 21, 1924 - Mines d' Otter Creek - last cleanup $1320.00

About $4000 dollars were spent suring winter from Nov.1, 1923 until May 1, 1924 in trials to reach bedrock by shaft and drilling. No definite results were obtained on account of quick-sand and water in the sinking attempts and bounders in the drifting attempt.

Hydraulic operations were retarded by the breaking of a gravel bank close to the dam at Blue Canon. The mine was partially filled up and considerable damage done. All the high water period was lost in repairing things and relaying pipeline. Hydraulic washing started on July 1st only instead of May 20th as usual.

Operations during the short period from July until October were conducted in a different place than heretofor - the idea being to prospect a high level bench, the reault of that work was satisfactory; a new pay channel being located and enough gold won therefrom to pay all expenses of the mining season, including spring deadwork. Further efforts by drilling were made to reach the deep gravels, which must be rich in gold, but the boulders are too numerous to permit of drilling successfully.

Two(?) pay streaks have so fat been proved to exist in the Otter Creek Valley, one being from 15 to 25 feet under the surface and resting on a high rim, the other being at an average depth of 80 feet under the surface and resting on a hardpan floor(false bedrock).

If the bottom pay streak resting on the deepest bedrock in the trough of the valley could be reached in the near future, successful hydraulicing could be carried on for a very ong period of years.

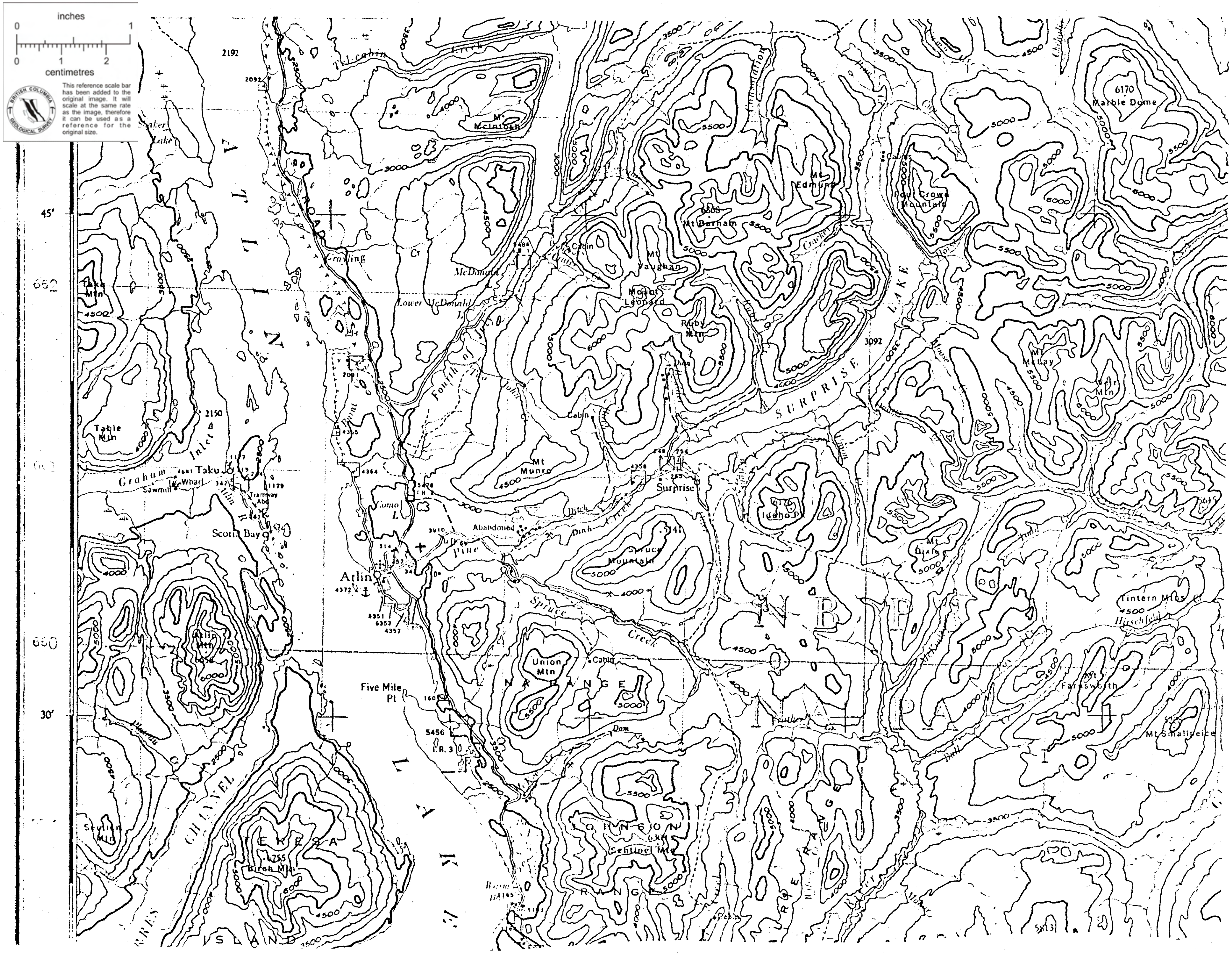
There will be no work this winter.

Hydraulic will be resumed next spring.

Water was normal; labour satisfactory, but short at times.

It seems that the best plan to explore the deep ground is to hydraulic a new cut from Surprise Lake, deeper than the actual one - other prospections seems absolutely worthless.

(signed) H.Maluin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ATLIN, 1898-1910:
The Story of a Gold Boom

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With Pictorial Supplement

August 31, 1907, it said, editorially: "We hope that all . . . the men in the camp . . . come forward and unite with this movement; . . . with a powerful organization behind us we need not fear any labour troubles. . . ."[76] In subsequent years Atlin had few strikes. Over the years, except for the early protest against the introduction of Orientals, Atlin's labour history, on the whole, has been serene.

From 1898 to the present day, Atlin's annual gold production has fluctuated widely, reflecting both local and world economic conditions. In 1898, the first year of recorded mineral production for the region, Atlin's placer-gold output was 3,750 ounces, valued at $75,000.[77] The figure was low because of the short working season remaining after the news of the discovery reached the outside world in August. In 1899, when an estimated 4,000 miners were in Atlin, the output soared to 40,000 ounces, valued at $800,000. That record of placer output has never since been exceeded. From 1900 to 1907 the production figures remained relatively stable, varying from 15,000 ounces in 1901 to 26,500 ounces in 1904. The average gold output for this eight-year period was about 21,000 ounces. Between 1898 and 1907, Pine, Spruce, Boulder, and McKee Creeks were the leading producers of placer gold.

In 1908 Atlin's gold production slumped sharply because of several factors, including the abandonment of dredging operations, the failure of the Atlin Consolidated Mining Company to operate as a result of difficulties with its steam-shovels, and development work which almost eliminated any production by the Pine Creek Power Company, another large producer of placer gold.[78]

From 1898 to 1949 Atlin's total mineral production was valued at $22,539,892.[79] Of this total, 667,714 ounces of placer gold accounted for $15,394,502; 201,882 ounces of lode gold accounted for $7,089,161; and small quantities of silver, copper, and lead accounted for the remaining $56,000. To the placer-mining total, Spruce Creek contributed almost one-half of the output, and Pine, Boulder, Ruby,

(76) *Ibid.*, August 24, 1907.

(77) The annual gold production of the Atlin District between 1898 and 1930 is summarized in British Columbia, Department of Mines, *Placer-mining in British Columbia . . .* (Bulletin Series, No. 2, 1930), Victoria, 1930, p. 18.

(78) British Columbia, Department of Mines, *British Columbia, the Mineral Province of Canada . . . 1909*, Victoria, 1910, pp. 29–30.

(79) British Columbia, *Annual Report of the Minister of Mines . . . 1949*, p. A 25.

and McKee Creeks, in that order, were the other major producers of placer gold.[80]

An interesting, if relatively unimportant, part of Atlin's gold-mining history is the discovery of large nuggets. Spruce Creek seems to have contributed most of the large nuggets recorded. In 1899 it offered one of 83 ounces, and in July, 1901, one of 36 ounces.[81]

One of the most glamorous aspects of Atlin's history is the story of the construction and operation of the White Pass and Yukon Railway. Before 1898 the idea of a railway up over the tortuous White Pass was considered a fantasy. The gold-seekers who entered the Yukon and Alaska in 1897 and early in 1898 via the Skagway and White Pass route had to follow a rough trail through the rugged valley of the Skagway River, across the summit of the White Pass, and through swampy country to Bennett Lake.[82] From Bennett Lake to Dawson the Argonauts followed a water route, except for several portages past rough rapids. Prior to 1898 several transportation companies had organized and built rude facilities to aid, at a heavy price, the weary travellers. For example, the "Brackett" toll-road from Skagway to White Pass City, a distance of approximately 13 miles, was available to those who could pay $20 for each ton of supplies that they had with them. Even with such aids, however, the Skagway River-White Pass route was a terrible ordeal. Hundreds of people either turned back at their first view of the pass or else died in their attempts to cross the divide. Nevertheless, it is estimated that, in 1898, 25,000 people crossed the White Pass and Chilcoot Pass routes on the way to Dawson.[83]

Early in 1898 four men gathered in Skagway to discuss the possibilities of a railway from Skagway over the White Pass, skirting the east shores of Summit, Lindeman, and Bennett Lakes, to the Watson River, at the northern end of Bennett Lake. From there the projected railway was to run to an as yet unchosen point on the Lewes River. These four men were: Sir Thomas Tancrede, an English engineer representing the firm of Close Brothers of London, England; Samuel H.

(80) British Columbia, Department of Mines, *Placer Gold Production of British Columbia* (Bulletin No. 28), Victoria, 1950, pp. 17–20.

(81) Atlin *Claim*, July 15, 1899; July 13, 1901.

(82) S. H. Graves, *On the White Pass Pay-roll*, Chicago, 1908, p. 34. Graves was the president of the White Pass and Yukon Route during the turbulent days of the construction of the railway.

(83) W. D. MacBride, "Story of the White Pass Railroad," Whitehorse *Star*, March 8, 1946.

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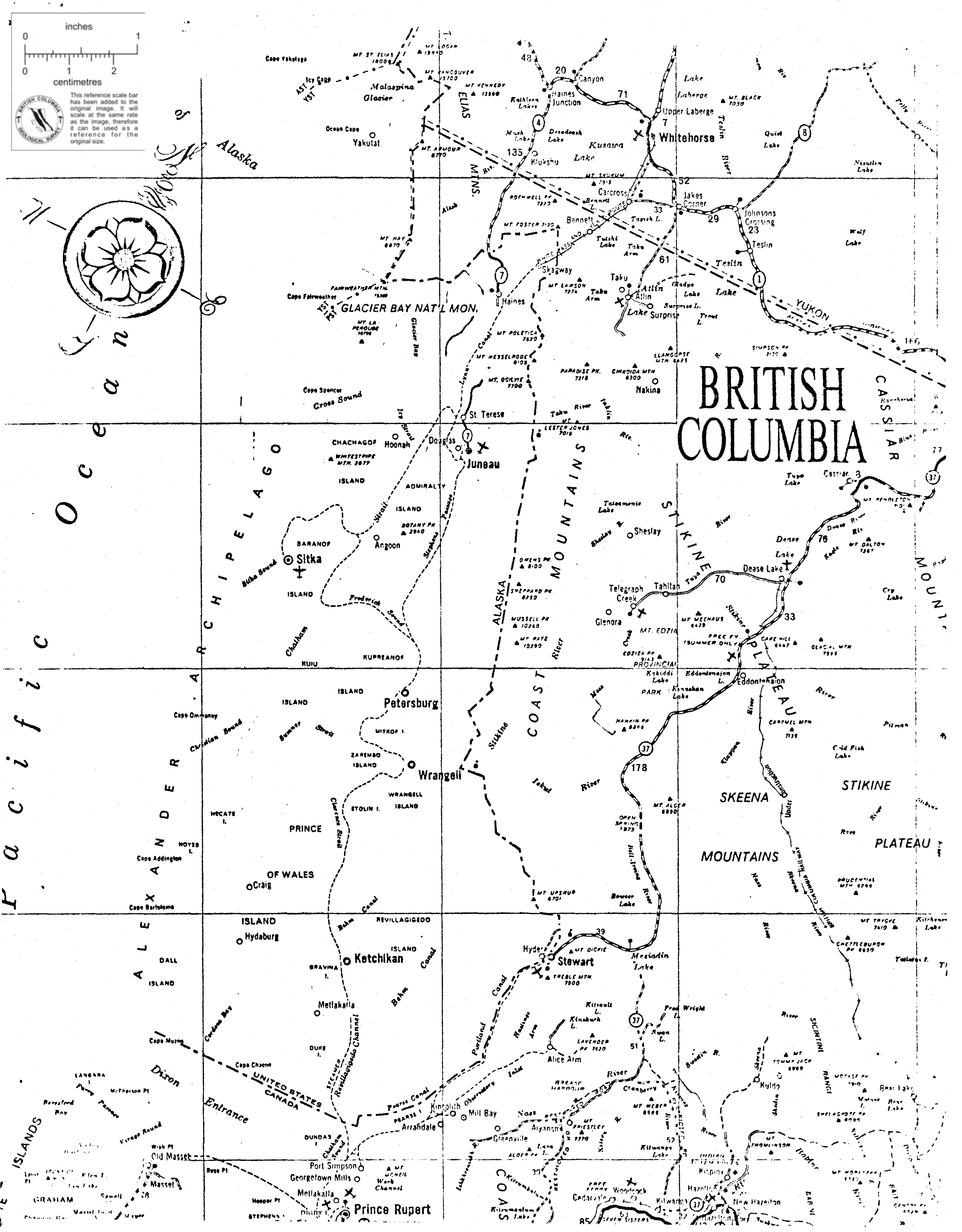
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WRANGELL ISLAND
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