Bugaboo Mines Ltd.

AIRBORNE SPECTROMETER SURVEY (1968)

Bugaboo Creek Area, B.C.

Oct. 1, 1968

L. T. Jory
F. Guardia

Consultants

Vancouver, Canada

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INTRODUCTION

Minerals containing uranium, niobium and the rare earths have been known to occur in placer deposits in the Bugaboo Creek area since 1953. After an unsuccessful application to the Canadian government for the production of uranium in 1957, leases owned by the Quebec Metallurgical Industries Limited were allowed to lapse. The leases were restaked in 1966 and 1967 by Bugaboo Mines Ltd. Dolmage, Campbell and Associates of Vancouver were engaged to conduct an airborne gamma ray spectrometry survey over the deposits with a view to establishing their exact limits and also to attempt to establish areas of higher grade within the deposits. However, excellent success at the beginning of the program in detecting the known deposits with the airborne equipment suggested the feasibility and advantage to Bugaboo Mines Ltd of rapidly prospecting previously unsurveyed creeks. The scope of the survey was therefore extended and changed from its original format.

This report outlines the results of the consequent survey, which was conducted during the period September 6-12, 1968. Recommendations on ground follow-up, staking and exploration are included in the report. Field data is appended to the report as a permanent reference.

LOCATION AND ACCESS: The area of the radioactive placers is located some 60 miles southwest of Golden in the East Kootenay district of British Columbia. (Figure 1.) The creeks surveyed lie between 116° 00' and 117° 00' West Longitude and 50° 30' and 51° 00' North Latitude and are those that drain from the Horsethief and Bugaboo granitic batholiths.

The greater part of the creeks surveyed that drain eastwards into the Columbia River are at present accessible by good logging roads that connect with the Golden-Cranbrook highway. East Creek, the only creek of interest draining to the west is not at present accessible by road and is indeed some 25 miles from the nearest all weather road and some 10 miles from the nearest logging road marked on current maps.

HISTORY: In 1953 uranium oxide and pyrochlore were identified in post glacial placer sand and gravel deposits in the upper Bugaboo Creek. This and a similar deposit on Forster Creek some 10 miles to the southeast were mapped and extensively explored by churn drilling by Quebec Metallurgical Industries from 1954 to 1957. In 1957 application for a contract to produce uranium was turned down by the Canadian government and the leases held in the area were allowed to lapse.

No further work was done in the area until, following restaking in 1966 and 1967 of the upper Bugaboo Creek and the Forster Creek deposits, this survey was initiated.

SURVEY

EQUIPMENT: The equipment used on this survey was rented from Westrim Mining Corp Ltd. and consisted of a Scintrex GISA-4 gamma integral spectrometer, using two 5-inch by 4-inch sodium iodide crystals, which was capable of differentiating between counts for potassium, uranium and thorium as well as indicating total radiation.

Survey height control was provided by a Bonzer radar altimeter, while fiducial points on the survey were recorded by push-button control.

Count rates, altitude and fiducials were simultaneously recorded on a Brush Mk 260 six channel recorder, using paper charts and pressure ink pens.

The equipment was mounted in a Bell 47 G3B helicopter chartered from Okanagan Helicopters of Vancouver.

FIELD PROCEDURES: Previous experience with the equipment had indicated that optimum results were obtainable using a ground clearance of 150 feet and a ground speed of 50 m.p.h. and using a two-second time constant. Initial experiment over the Bugaboo Creek deposit showed that the only feasible method of surveying, using these constants, was to fly down the course of the creeks. The narrow valleys and the height of the trees did not allow transverse line flying as was originally proposed, and in any event it was found, both in the air and on the ground with a hand-held scintillometer that vegetation cover had a pronounced dampening effect on radiation. Consequently all surveys were flown as close as possible to the course of the creeks where exposed gravels would give a clearer indication of the relative radiation levels of the deposits.

Location was established in flight by the geologist operating the instruments, on standard topographic maps on 1 mile and 2 miles to the inch scales.

The charts were examined immediately after each flight and anomalous results plotted onto the maps.

A ground check of the instruments was performed before and after each flight in order to check that instrumentation was in order throughout the flight period. In addition period passes over the Bugaboo Creek placer were made to check calibration.

REPORT: This report outlines the results and conclusions reached and makes recommendations for future work. While selected sections of the recorded data have been presented at the end of the report to illustrate general results, the ground checking recommended should be done using the full data available on all charts, which is presented with this report.

No attempt is made to estimate the widths of placer deposits indicated as this could only be done very crudely using topographic maps, and then only by assuming homogeneity. Stereographic air-photo coverage has been ordered and should prove valuable during ground checking and exploration.

SUMMARY AND RECOMMENDATIONS

At the request of Bugaboo Mines Ltd, the owners of placer leases in the Bugaboo Creek area, southwest of Golden in the East Kootenay district of British Columbia, Dolmage, Campbell and Associates conducted an airborne spectrometer survey in September, 1968, over all major creeks draining from the granitic rocks of the area.

Previous work done on two placer deposits, in Bugaboo Creek and in Forster Creek, between 1953 and 1957, had indicated that niobium, uranium and rare earths minerals existed in the black sand fraction of post-glacial sand and gravel deposits. Possible commercial values in uranium were indicated in the early sampling and a potential reserve of 65 million cubic yards was established by ground reconnaissance and drilling. The ground was restaked in 1966 and 1967.

The 1968 airborne survey resulted in the discovery of up to 5 new placer deposits and in the extending of known deposits. It is presumed that the potential placer reserve has been increased significantly although nothing is known of the basis for the original 65 million cubic yard estimate. Furthermore, an examination of the airborne survey records indicates that some of the new placer deposits are probably more radioactive than the deposits previously drilled. In this respect, Vowell and Malloy Creeks, north of the original Bugaboo Creek placer, appear particularly favourable for early exploration.

It is recommended as a result of this airborne survey that:

1. Ground follow-up with a scintillometer be started as soon as possible to check the airborne anomalies.

2. All anomalous ground comparable to the Bugaboo Creek placer be staked.

3. Surveying and sampling of all staked ground be initiated using churn or Becker type drilling and bulk sampling with excavating equipment.

CHARACTER AND POTENTIAL OF THE DEPOSITS

The uraniferous placer deposits of the Bugaboo Creek area have been derived by post-glacial erosion of the Bugaboo and Horsethief batholiths and the consequent deposition of the resultant sands and gravels in the locally overdeepened valleys.

Testing by churn drilling in the deposits of Bugaboo Creek and the mouth of Forster Creek have indicated that the placers contain a large black sand fraction, concentrated from minor constituents of the granites, which is relatively rich in the following minerals.

Magnetite	
Pyrochlore	(niobium rich)
Euxenite	(niobium-rare earths)
Allanite	(rare earths)
Uraninite	(uranium)

The testing by the previous owners of the properties indicated a recovery of 75 and 80 percent of the niobium and uraninite respectively, producing quantities of uraninite that could be commercial at the currently anticipated price for uranium oxide of $8-$10 per pound. The actual grade of the gravels as determined by Quebec Metallurgical Laboratories Ltd. is being presently investigated.

Only 4 million cubic yards were tested in detail but because of the fairly uniform nature of the deposits the figures were used to calculate a potential reserve on then known deposits of 65 million cubic yards.

The results of the 1968 aerial survey indicate that the potential reserves of all the available deposits will be substantially greater than those estimated for the two previously known deposits and there is reason to believe that an improved grade may be found in some of the new, untested, deposits.

1968 AERIAL SURVEY

SPECTROMETRIC INTERPRETATION:

The spectrometer was flown over all major creeks draining from the Bugaboo and the Horsethief batholiths, (Fig. 2). Initial flying and calibration was made over the known deposits of the Bugaboo and Forster creeks and the former was periodically revisited during the survey as a quick visual check that all instruments were functioning correctly.

Predictably it was found over the known deposits that readings on the uranium and thorium channels rose appreciably while there was only a slight rise in the potassium reading. The less sensitive and therefore smoother total count trace has been found to be the most useful one for the majority of the present interpretation. The results for total count on each creek flown have been reproduced in figures 3-6 at the end of the report.

The effect of variations in flight height on all channels has not been fully evaluated, but flights over the Bugaboo Creek deposit at 150 feet and 250 feet suggested that the total count was reduced by approximately one-third at the latter height. However, small, local variations in flight height appear to be of little importance in the overall interpretation over long, continuous deposits. However if any attempt be made to outline areas of higher grade within a deposit, the height factor must be borne in mind.

It was found that in flying over granitic bedrock or moraine material largely derived from the bedrock that the mass effect created anomalies comparable to those over true placer deposits. In most cases the distinction was clear; an anomaly either falling on gravel accumulations away from the granite or on granite terrain with no large gravel deposits, but in some cases where gravels lie within the granitic areas interpretation of anomalous results must await ground checking. Of relevance in Stockdale Creek, where exposed granite gave anomalous results, gravels derived upstream of the granite yet deposited on granite produced a dampening of radiation. This suggests that gravels in a similar situation yet not producing the dampening effect are indeed themselves uraniferous.

SPECTROMETRIC RESULTS:

Bugaboo Creek: The anomaly detected over the original Bugaboo Creek showing was used as a criterion for the interpretation of all other surveys. Experiments over the showing indicated that only the currently exposed gravels gave significant radiation and that flying some 300 to 400 feet away from the creek but over the alluvial flats, radiation was so reduced as to be almost undetectable.

Both the north and south forks of the creek were flown. The results for the North Fork suggest that good grade placer is developed close to the present day glacier but the south fork, although having extensive alluvial flats and well exposed gravels, gave no anomaly. The essential difference between the two streams is that no granite outcrops within the catchment area of the south fork.

Vowell Creek: Results for the upper Vowell Creek indicate that much of the extensive alluvial material in the generally wide valley is of prime interest. Similarly the tributary Malloy Creek gave good readings almost to its mouth and material from it appears to upgrade gravels downstream in Vowell Creek. Both the Vowell and Malloy creeks flow from glaciers developed on the Bugaboo granite mass. Lower tributaries of Vowell Creek, known as Conrad and Crystalline creeks gave no significant anomalies, despite good widths of exposed gravels in the latter. However close to the mouth of Conrad Creek deposits in the Vowell gave good readings.

Howser and Rory Creeks: The upper Howser Creek and its tributary Rory Creek were flown with no deposits detected. Only a very small part of Howser Creek flows from granitic rocks and alluvial material is generally poorly developed, much of both creeks being confined in steep-sided valleys and gorges.

East Creek: Results for the upper part of East Creek suggest that valuable ground exists but sizeable deposits are confined to an area close to the creek head. Locally veryhigh total count response may in part be due to the mass effect of the surrounding granite mountains but undoubtedly good grade placer exists in this creek.

Glegerich Creek: Glegerich Creek draining fromactiveglaciation over granitic rocks appeared a good target but generally the gradient is steep and no gravel deposits of significance were seen. However, the chart obtained on the flight indicates that low temperatures near the glacier cooled the instrument below its optimum operating temperature resulting in flattening of the uranium response. The results cannot be considered reliable. Remoteness and lack of gravel deposits suggest that, in any event, this creek cannot be considered a target

for further investigation.

Forster Creek: A good tract of alluvial material close to the head of Forster Creek gave readings that indicate ground comparable to the original showings exists. The effect of surrounding granite and granite exposed in the steeper parts of the creek is unknown and ground checking is required.

The original showing at the mouth of Forster Creek, explored by the earlier drilling, was clearly detected. Two passes across the creek near its mouth have indicated that ground underlain by the uranium-bearing gravels is rather more extensive than that at present claimed.

The showing at the mouth of Forster Creek is singular in that it is the only one which occurs well away from the granite masses. It would seem that some form of flushing of heavy sediment has occurred in this creek.

Stockdale and Horsethief Creeks: Good total count responses on Stockdale and Horsethief Creeks were observed to be largely associated with outcroppings of granite and indeed when passing over some alluvial flats counts dropped considerably. Although the creek passes over the same granite from which the Forster Creek deposits were derived the amount of alluvial material in the flats actually derived from the granite is probably very small as no active glaciers on the Horsethief batholith spill over onto the Horsethief Creek side. However deposits of interest may exist and ground checking is required.

It will be observed in the figures 3-6 that the magnitude of the responses obtained in the upper reaches of East, Forster and particularly Vowell and Malloy creeks are considerably in excess of those obtained over the original showings, on which most of the drilling and testing has been conducted in the past. Although other factors, chiefly the possibility of better exposures in the former creeks, may account for some of the better response, it is reasonable to assume that a higher grade in the newly-discovered deposits is a distinct possibility.

CONCLUSIONS

The results of airborne spectrometry on creeks draining the Horsethief and Bugaboo batholiths have outlined areas of interest that were previously unknown or are extensions of known deposits. Interpretation in some instances is open to question and ground checking is required.

Although the interpretation is qualitative and no safe estimate of grade may be made, it would seem from the overall amplitudes of the anomalies that direct extrapolations of grade for the newly discovered deposits can be justified using the responses over the known deposits as a basis for comparison. The results of such correlation suggest that some of the new deposits are higher grade than the original deposits. It is further concluded that the extensive deposits on Vowell and Malloy Creeks should be given first priority in further testing because of their more favourable size, apparent grade and accessibility compared to untested deposits on other creeks.

The creek-length of possible radioactive placer deposits delineated by the present airborne survey is 2 1/2 times the creek-length of the previously known deposits. The total length, shown on Figure 2, is 36 miles for the anomalous and possibly anomalous deposits. The presence of a very large reserve of radioactive placer would lower the grade necessary for profitable exploitation of the deposits.

The next phase of exploration should be a comprehensive drill sampling of the best deposit. Such drilling can best be done by the Becker Overburden Hammer Drill, one of which is presently being used by Dolmage, Campbell and Associates Ltd on another gravel-sampling project with excellent results.

RECOMMENDATIONS:

1. The anomalies detected by the airborne survey must be checked on the ground with a scintillometer. The nature of the deposits appears such that an instrument indicating total count alone will be adequate. In comparing the ground and airborne work cognizance should be given to the possible mass effects of granites and the better exposed stretches of gravel.

2. The owners of the leases should take immediate steps to claim all ground, which this survey and the ground checking, indicate to be of comparable importance to the Bugaboo Creek placer, with possible emphasis being placed on the Vowell and Malloy Creek deposits.

3. Following staking, a program of surveying and sampling should be initiated. Although drilling will be required for testing the depths of the deposits and establishing thicknesses of materials, much rapid and useful bulk sampling may be done using a tractor equipped with a back hoe.

Respectfully submitted,

L. T. Jory, P. Eng., Ph. D.

F. Guardia

October 1, 1968

CERTIFICATE

I, Lisle T. Jory, of Vancouver, Canada, do hereby certify that:

1. I am a consulting geological engineer.

2. I am a graduate of the University of British Columbia, (B.A.Sc., Geological Engineering, 1950), and of the California Institute of Technology, (Ph.D., Economic Geology and Geochemistry, 1964).

3. I am a registered Professional Engineer of the Province of British Columbia.

4. From 1950 until the present I have been engaged in mining, mining exploration and engineering geology for various companies in Canada. I was chief geologist for Eldorado Mining & Refining Co. Ltd for six years and Senior Engineering Geologist for International Power & Engineering Consultants for three years.

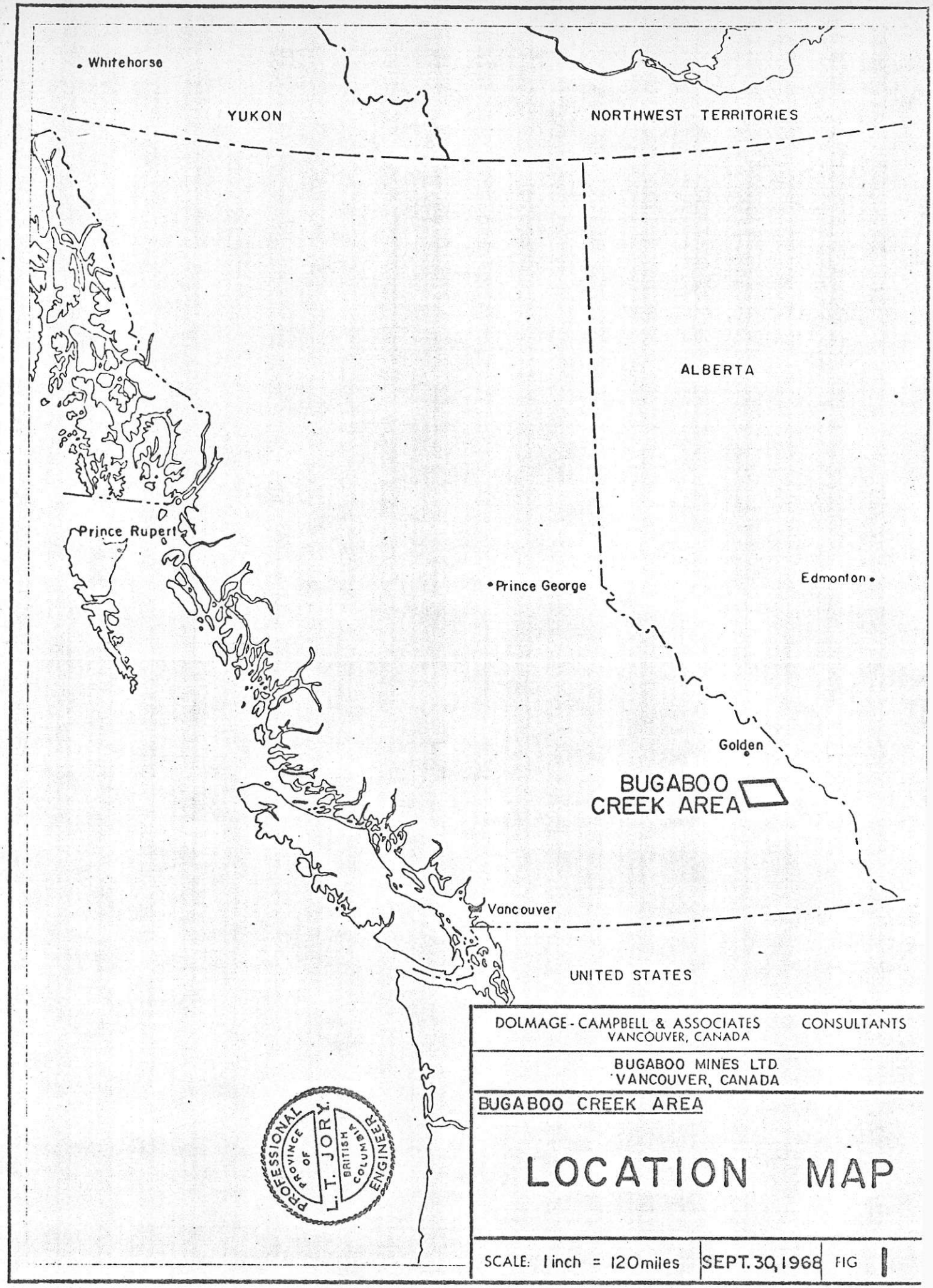
5. I directed the work discussed in this report and have examined all the field data.

6. I have not received, nor do I expect to receive, any interest, directly or indirectly, in the properties or securities of Bugaboo Mines Limited.

Respectfully submitted,

Lisle T. Jory, Ph.D., P.Eng.,

Vancouver, Canada.



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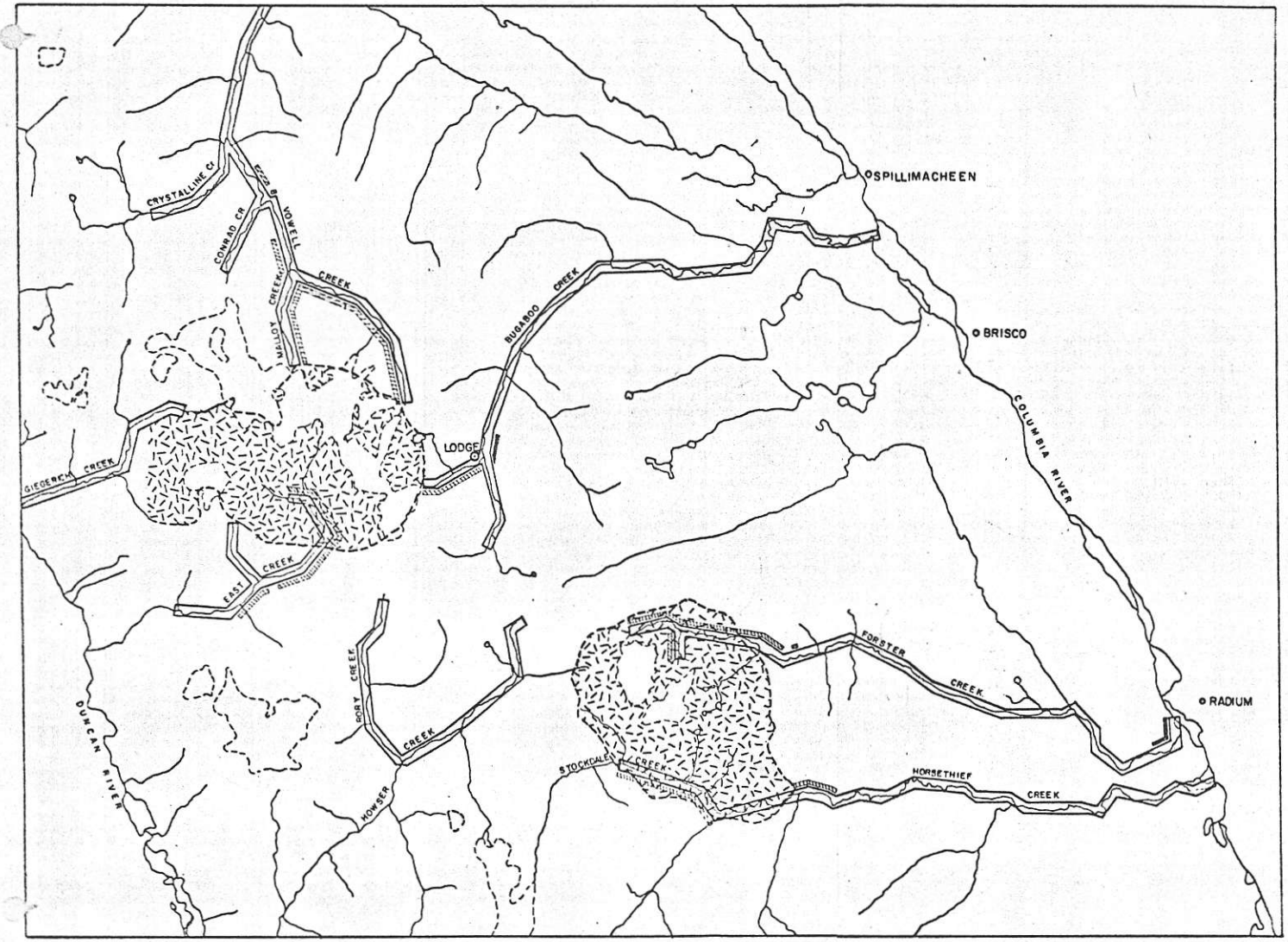
BUGABOO CREEK AREA

LOCATION MAP

SCALE: 1 inch = 120 miles | SEPT. 30, 1968 | FIG 1



LEGEND

ICEFIELD

GRANITIC INTRUSION

CREEK SURVEYED

DEPOSIT KNOWN AND TESTED IN 1957

ANOMALOUS AND POSSIBLE ANOMALOUS ZONES INDICATED IN 1968

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — L. T. JORY

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VANCOUVER, CANADA

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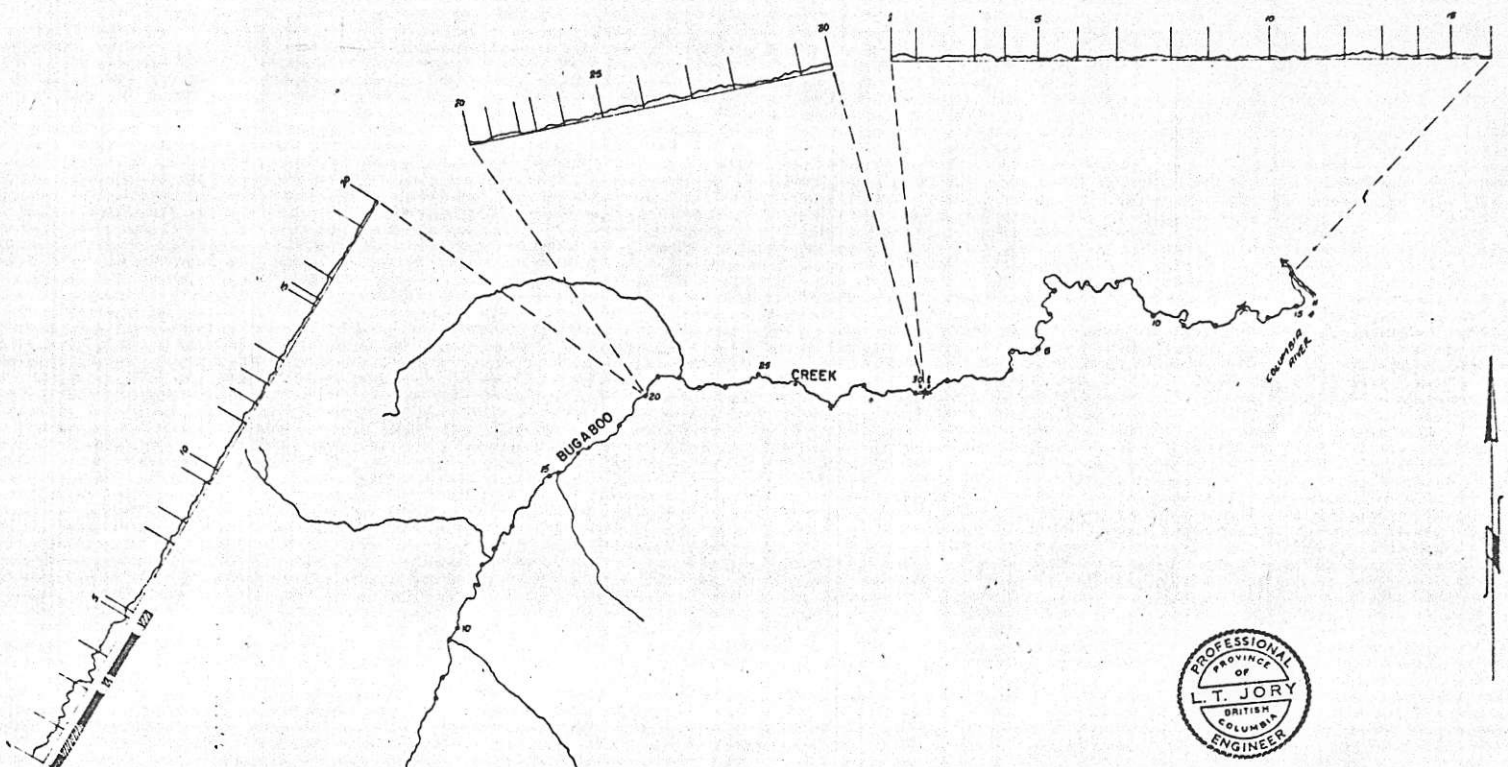
AIRBORNE SPECTROMETRY

BUGABOO CREEK AREA

SCALE: 1" = 4 miles | SEPT. 30, 1968 | FIG. 2



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PROVINCE OF BRITISH COLUMBIA
L. T. JORY

LEGEND

FIDUCIAL MARKS

TOTAL COUNT TRACE

ANOMALOUS

POSSIBLY ANOMALOUS

COURSE OF CREEK with FIDUCIAL POINT LOCATIONS

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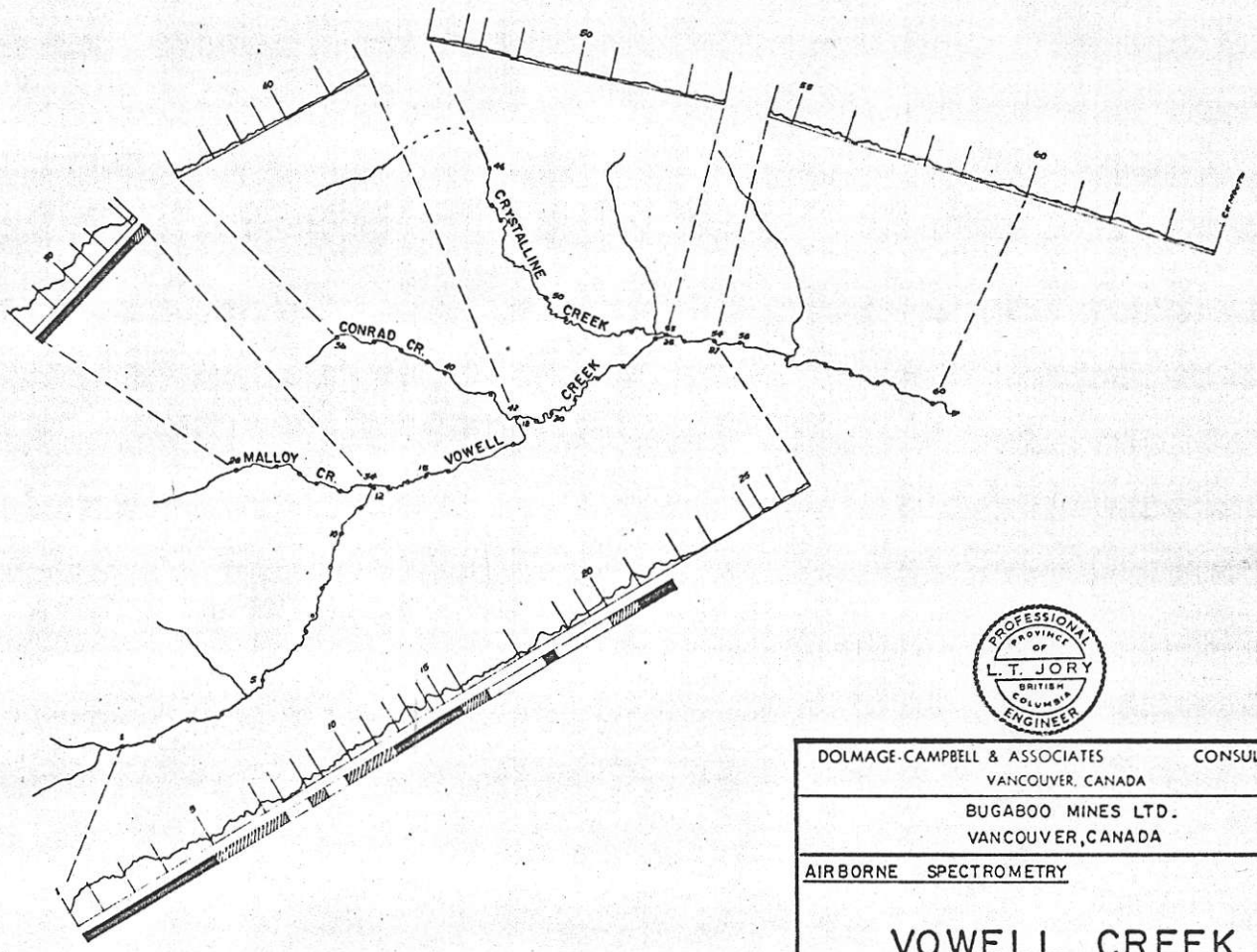
BUGABOO CREEK

SCALE 1" = 2 miles | SEPT. 30, 1968 | FIG 3

LEGEND

- FIDUCIAL MARKS
- TOTAL COUNT TRACE
- ANOMALOUS
- POSSIBLY ANOMALOUS
- COURSE OF CREEK with FIDUCIAL POINT LOCATIONS



PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
L. T. JORY

DOLMAGE-CAMPBELL & ASSOCIATES CONSULTANT
VANCOUVER, CANADA

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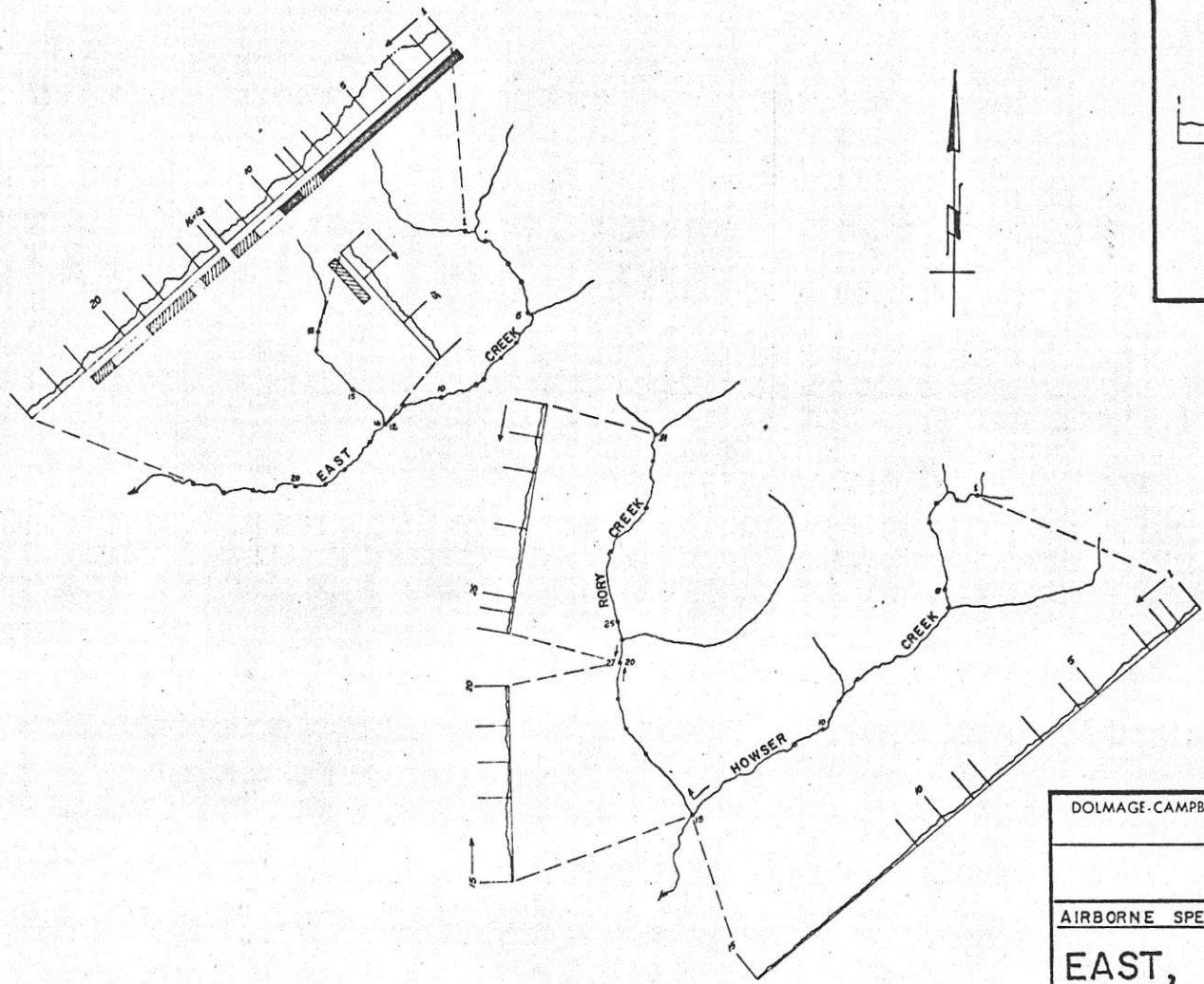
VOWELL CREEK

SCALE 1" = 2 miles | SEPT. 30, 1968 | FIG 4



LEGEND

- FIDUCIAL MARKS
- TOTAL COUNT TRACE
- ANOMALOUS
- POSSIBLY ANOMALOUS
- COURSE OF CREEK with FIDUCIAL POINT LOCATIONS

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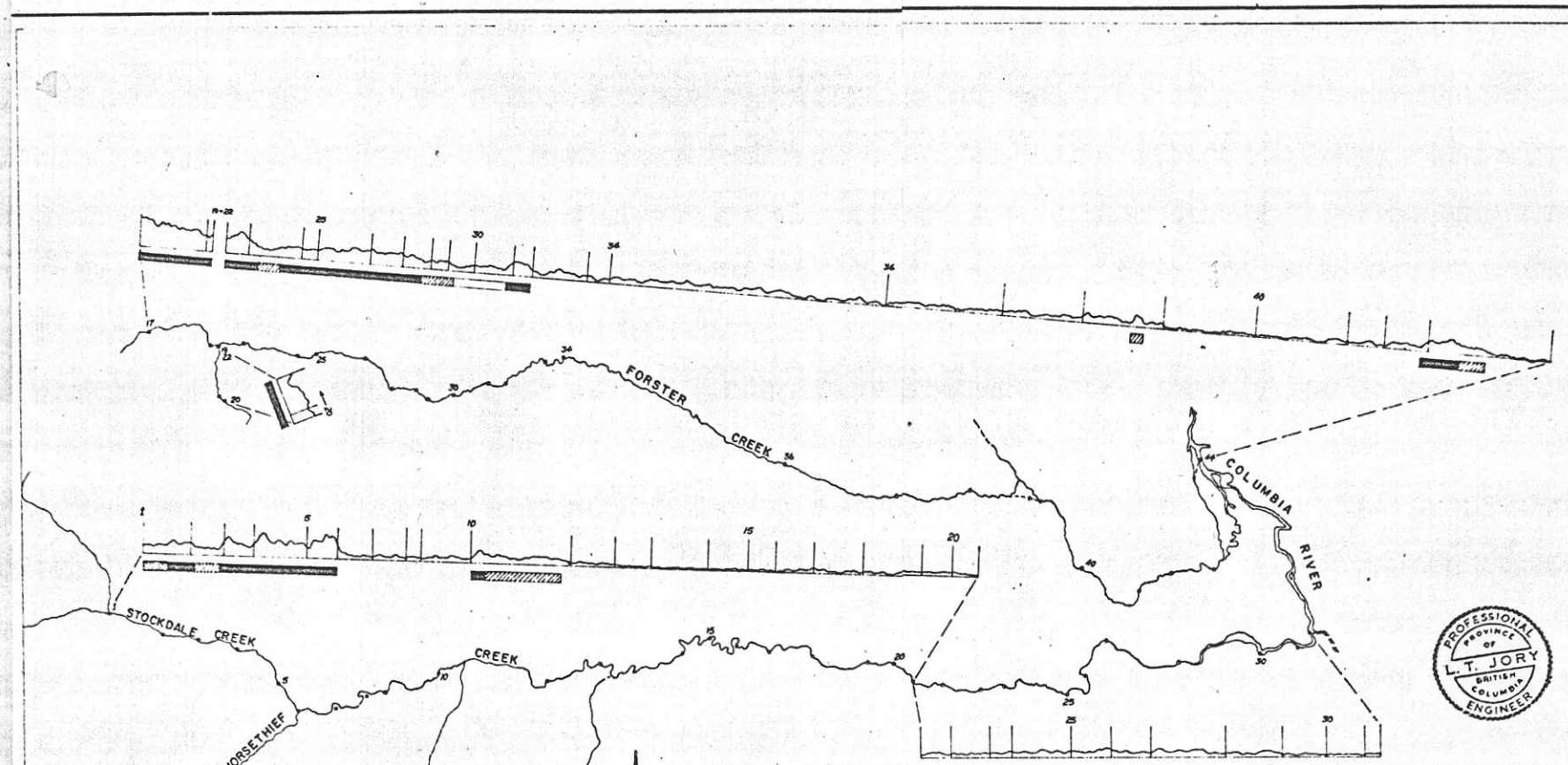
EAST, RORY & HOWSE CREEKS

SCALE: 1" = 2 miles | SEPT. 30, 1968 | FIG 5



LEGEND

- FIDUCIAL MARKS
- TOTAL COUNT TRACE
- ANOMALOUS
- POSSIBLY ANOMALOUS
- COURSE OF CREEK with FIDUCIAL POINT LOCATIONS

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FORSTER & HORSETHIEF CREEKS

SCALE: 1" = 2 miles | SEPT. 30, 1968 | FIG 6