

Draft

INTRODUCTION:

The region encompassed in the Portland Canal Project extends northward from Alice Arm to Bowser Lake ( $56^{\circ}25'$ ), and eastward from Portland Canal to the Kinskuck Lake ( $129^{\circ}23'$ ). Work was concentrated in three areas: a) North Portland Canal, b) South Portland Canal, and c) the Kitsault River. The North and South Portland Canal areas lie south of Stewart and east of Portland Canal. ~~The Kitsault River area includes the south and east edges of Portland Canal.~~ The Kitsault River area includes the south and east edges of the Cambria Snowfield from Upper Kshwan River north to Flat Creek and south to Kinskuck Lake. Some work was done on Roosevelt Creek and Ore Mountain northeast of Stewart and on Todd Creek 23 miles north of Stewart. Helicopter traverses were made to outlying areas to check geology or reported gossans. (For location of areas prospected, see Map 1).

Included within the exploration area are three former important producing mines, one presently operating mine and three prospects actively being explored. The former producers include the Hidden Creek and Bonanza deposits from which were mined 23,900,000 tons of 1.5% copper and 724,000 tons of 3% copper respectively. Properties now held by Dolly Varden Mines produced 1,365,000 oz of silver in the past and <sup>are</sup> ~~is~~ at present being further developed. Other properties being actively or recently explored are the Bell Molybdenum, Silurian Chieftan and Ajax <sup>an</sup> Molybdenum deposits. B.C. Molybdenum is presently operating at a rate of 6,000 tons per day. Other small silver occurrences are being explored by individuals and companies.

The town of Stewart is the distribution centre for the Portland Canal - Granduc Areas. Population is expected to reach 1,000 to 1,200 when the Granduc Mine goes into production. Trans Provincial Airways run two flights a day with Grumman Goose aircraft between Stewart and Prince Rupert. These connect with Canadian Pacific Jetservice from Prince Rupert to Vancouver. Northland Navigation operates a weekly passenger-freight boat service from Vancouver. A road connecting Stewart and Terrace is expected to be completed in 1970 and work on the Stewart-Cassiar Road, which will connect with the Alaska Highway at Watson Lake is continuing slowly.

Topography is rugged. Like other parts of the Coast Range Mountains, creeks form steep-walled canyons that are often impassable. Lower valleys covered with dense brush are a veritable jungle of devils club and tag alder. At times, the only way through this brush is via bear trails. Needless to say, this type travel can be harardous if one meets a bear - depending on which end of the bear one encounters.

Ridges provide good helicopter landing sites, stream beds do not always have gravel bars on which to set down, hence crews often could not be put where desired.

Glaciers which cling to high mountain cirques are <sup>3</sup>receding at a rate of about 100 feet per year. The Cambria Snowfield lying east and south of Stewart is about 10 miles wide and 20 miles long. It forms a dome of ice and snow with fingers of crevassed ice extending down U-shaped valleys for several thousand feet to north, south, east and west. This snowfield covers much of the projected copper-silver belt between the

Kitsault River and Stewart.

Weather during the first three weeks in June was clear and sunny; the remainder of the season exasperating. Low cloud and fog which clung to the mountains, combined with heavy rain made exploration difficult for prospecting crews and servicing camps by helicopter hazardous. There were 16 days without rain in June, 9 in July and 7 in August.

Precipitation is usually high in this region but this past season was reported to be one of the wettest in 26 years.

#### METHODS OF EXPLORATION:

The methods of exploration as in the past years included aeromagnetic work, ground prospecting, geochemistry (stream silt sampling) and geological mapping. The exploration crew consisted of three 2-man teams, two made up of students, one of experienced prospectors. These teams worked out of 2-man fly camps.

The main camp was situated on Portland Canal at Fords Cove, 25 miles south of Stewart. Weekly supplies were picked up at Stewart by helicopter. There are no float planes for charter stationed at Stewart.

#### AEROMAGNETIC SURVEY:

Approximately 140 square miles were flown with an Elsec airborne magnetometer for the purpose of trying to locate Anyox-type mineralization. Two lines were flown over the Hidden Creek deposit, one over the Bonanza Creek and one over the Doubel<sup>le</sup> Ed to see what the response would be over this type of deposit. The Hidden Creek profiles are shown in Figure 1, Page    . The other two showed nothing, possibly because the

flight lines missed the mineralization. The Anyox-type deposits tend to be small in horizontal dimension but have considerable vertical extent.

Because of the rugged nature of the terrain, flying was done on contour on 500-foot elevation intervals with the aircraft about 350 feet above the land surface. Topographic maps at 1" = 1/2 mile (North Portland Canal Area) and 1" = 1/4 mile (South Portland Canal Area) were used as control.

Six aeromagnetic highs were examined in the South Portland Canal area and four in the north. *(Location of anomalies are shown on map 2)* ~~These are discussed below:~~

Anomaly #1:

This anomaly occurs on a bench at the 3,700-foot elevation on the west side of Portland Canal one mile north of Donahue Creek. The aeromag profile is similar in size and shape to that over the Hidden Creek deposit at Anyox. *(See Fig 2)* Follow-up work included a ground magcrometer survey over the main part of the aeromag anomaly and a limited amount of JEM work on both 1800 and 3600 cycles. Conditions under which the E.M. Survey was conducted were not good. Weather was damp and the instruments at times did not operate properly. Results of the JEM Survey are shown on Map 3.

Ground magcrometer work outlined a number of narrow magnetic highs generally elongated in a north-northwesterly direction. *(map 4)* Mag intensity ranges from a low of 11,953 gammas to a high of 15,299 gammas. Average is about 12,800 gammas. Highs with  $> 13,500$  gammas are considered anomalous. Six of these have dimensions of greater than 100 feet by 200 feet.

Geology: Anomaly #1

Anomalous area is underlain mainly by dark green andesitic volcanic rocks. These rocks vary in texture with intensity and/or conditions of metamorphism. Most common alteration is a slight schistosity: occasionally the rocks are gneissic. In a small lake around the shore, rocks are a dark medium to fine-grained diorite. Relation to volcanic rock is presumably intrusive but may also be a dioritized phase of the andesite. Outcrops are below lake level and samples are not easily obtained, hence relations one to the other are not clear. This rock at the lake is moderately to strongly magnetic. Diorite found to the northeast and west of the lake is nonmagnetic. Cutting the diorite on the west shore of the lake and again 500 feet to the south is a quartz biotite-gneiss with squarish blebs of pyrrhotite and associated chalcopyrite. Pyrrhotite blebs are up to 3/4" long. Width of gneissic rock is about 10 feet, att.  $130^{\circ}/44\text{SW}$ . Along the west side of the anomaly, rocks are siliceous, in part banded, <sup>and have</sup> with an easterly dip. East of the anomaly are 2 outcrops of metamorphosed argillaceous sediments. (see map 5; geology)

Rocks under magnetic highs are magnetic and could conceivably explain the aeromagnetic anomaly. E.M. work is inconclusive - 3 weak crossovers are indicated. At the time of the E.M. work, weather was wet and crews had difficulty in duplicating results. We could only assume that it was the damp conditions which affected the instrument.

Work on Anomaly #1 is inconclusive. Magnetite in the underlying rocks could explain the aeromag anomaly, however, ground prospecting found small amounts of chalcopyrite and pyrrhotite that should be further

explored. Two I.P. lines over the best ground magnetometer anomalies should be adequate to prove or disprove the presence of sulphides.

Anomaly #2:

Anomaly #2 occurs on a southern tributary of Bonanza Creek 4 miles west of the Bonanza Creek Mine. It occurs at the contact between volcanic rocks and granodiorite <sup>near</sup> ~~at~~ the intersection of northerly and northwesterly faults. Magnetite occurs as veinlets up to 1/4" in width, in part with epidote, cutting a fine-grained phase of the granodiorite. Westerly striking andesite dykes cut the intrusion. The anomaly is adequately explained by magnetite in the rocks.

Anomaly #3:

The south slopes of Mt. Clashmore northeast of Bonanza Lake are underlain by volcanic and schistose volcanic rocks. These are cut by a granodiorite intrusion which forms the peak of Mt. Clashmore. Rocks are highly magnetic and can adequately explain an airborne magnetic anomaly that occurs along the south slope of Mt. Clashmore. There are small scattered occurrences of chalcopyrite in this area which have no direct relation to the magnetic highs and are not considered significant. Two lines of soil samples plus ground magnetic work was done. Soils gave normal values in copper and molybdenum.

Anomaly #4:

Anomaly #4 is situated 1/2 mile north of Carney Lake where a northwesterly dyke swarm cuts folded sediments. Intruding argillaceous

sediments is a small diorite plug. The diorite which is strongly magnetic is the cause of the magnetic high. No sulphide minerals were found.

Anomaly #5:

This anomaly lies north of Mt. Clashmore on the north side of Donahue Creek. Rocks are volcanic flows intruded by Coast Range granodiorite. Altered volcanic rocks at <sup>the</sup> contact carry magnetite; no sulphides were found. Silts gave background copper and molybdenite for this region.

Anomaly #6:

A serpentine mass striking south-southwest accounts for the anomaly west-northwest of Mt. Clashmore. The serpentine is in part brecciated. No metallic minerals with the exception of magnetite were seen. <sup>Exposed</sup> Serpentine mass is 30 ft wide and 100 ft long cutting schistose volcanic <sup>rocks.</sup> Silts were not anomalous.

NORTH PORTLAND CANAL AREA:

Anomaly #1:

East of Engineers Point, two diorite dykes cutting andesitic volcanic rocks in a west-northwesterly direction show up clearly on the magnetometer. These could be traced on both airborne and ground magnetic work. No copper or molybdenite was found associated with the dykes.

Intrusive rocks, <sup>generally</sup> produce  
~~distinct~~ magnetic patterns  
~~profiles~~ which are, ~~usually~~ distinguished  
from the other rock types.



Anomaly #2:

Anomaly #2 is located south of Outram Lake between the Sutton and East Georgia Rivers. Ground checking revealed <sup>a</sup>basic dyke cutting volcanic rocks. Some pyrite occurs in the country rock but no copper or indications of copper were found. The dyke was strongly magnetic. A second, but <sup>negative</sup> low anomaly 1/2 mile to the northeast was checked ~~nothing was found.~~ — Some sedimentary <sup>units</sup> rocks occur interbedded with the volcanic rocks. No economic minerals were found.

Anomaly #3:

Northeast of Coon Bay on Portland Canal, granodiorite cuts argillites, andesites and siliceous volcanic rocks. The granodiorite shows up as a magnetic high where it is in contact with these rocks. Some copper was found as sparse disseminations in argillites with pyrite. These occurrences were unimportant.

Comments on the Magnetics:

It is interesting to note that in the North Portland Canal areas the intrusive rocks have a greater magnetic intensity than similar rocks in the South Portland Canal region. Sedimentary and volcanic rocks magnetic profiles are similar in intensity and character, consequently it is not always easy to distinguish one from the other. The intrusive <sup>rocks</sup> ~~are~~ <sup>produce significantly different profiles</sup> ~~sufficiently different~~ generally to ~~pick these~~ <sup>read</sup> from the tapes. Where intrusive <sup>dip at a 12° angle</sup> contacts are shallow however, the distinction is not so marked. Serpentine are magnetically high and occur as narrow elongated masses. Andesite and diorite dykes commonly have considerable magnetite and show up as magnetic highs. In general, geological interpretation based on magnetics is more

reliable in the south region than in the north.

*Regional*  
GEOLOGY:

The area of interest lies along the eastern margin of the Coast Range Mountains north of the 55th parallel. Underlying rocks consist of a thick assemblage of andesitic lavas, agglomerates, tuffs and pillow lavas with interbedded argillites, greywackes, and volcanic sandstones. These range in age from Triassic (Stewart Complex) to Lower Cretaceous (Bowser Assemblage).

Invading the above assemblage are rocks of the Coast Range intrusive complex, Triassic to Cretaceous in age, and small Early Tertiary and older granitoid plugs. The Coast Range rocks are variable in composition - diorite, quartz diorite, and granodiorite are most abundant. These occur west of a line between Stewart and Alice Arm. The small Early Tertiary plugs are mainly quartz monzonite in composition. It is with these Tertiary intrusions that MoS<sub>2</sub> deposits occur. Other small intrusions invading the volcanic-sedimentary rocks include a variety of compositions.

Cutting the Bowser and Stewart rocks are northwest trending dyke swarms. These vary from lamprophyre, andesite and feldspar porphyry to diorite in composition and usually if not always, are in close relation to known mineral deposits.

Faulting is prevalent in northwesterly to northeasterly directions. Topographic lineations suggest a strong northeasterly structural direction. It is significant that mineralization in the B.C. Molybdenum deposit at Alice Arm is in northeasterly fractures and quartz veins; in Granduc it is in north-northeast folds accompanied by a north-northeasterly fault.

Northeasterly and northerly faults are present in the Anyox deposits however their relation to mineralization is uncertain. The anyox deposits occur in a remnant of Triassic volcanic and sedimentary rocks within the Coast Range intrusion, hence the structural relation may be somewhat obscured. *For geology see map. 6*

Mineralization occurs in three forms and environments:

a) Anyox type - these are massive lode type copper-silver deposits *usually* associated with a sedimentary-volcanic contact, b) porphyry type molybdenum deposits - these are in Early Tertiary quartz monzonite plugs intruding Stewart (Hazelton) and/or Bowser sedimentary and volcanic rocks and, c) Ag-Pb-Zn and Cu-Ag (includes gold quartz veins) vein type deposits - these occur in quartz-filled fractures, faults and breccias associated with faulting. In the case of the Homestake Creek deposits north of Alice Arm, mineralization tends to be peripheral to a *leucocratic* quartz-feldspar intrusion.

Exploration methods used were designed to search for all types of deposits. The Anyox deposits have associated pyrrhotite and respond favourably to airborne magnetometer surveys, hence an airborne survey was flown in areas where this type mineralization could be expected. Porphyry type deposits can be picked up by stream sediment sampling. Silts were tested for Mo. The Ag-Pb-Zn and Ag-Cu deposits should respond to Ag, Cu and Pb geochemistry.

Ground prospecting was emphasized. Crews were alerted to the presence of hornfels around porphyry deposits and the presence of dyke swarms near or associated with the mineral occurrences in the Anyox and Dolly Varden areas.

### Geochemistry:

The topographic relief is moderate to rugged with well developed drainage patterns. Annual rainfall exceeds 150 inches - this past season was particularly wet. Since much of the area is covered by ice and snow, streams <sup>flow varies directly with</sup> are ~~subject to~~ changes in weather conditions. Hot weather increases stream flow as does increased rain. Only during cool cloudy days does stream flow drop appreciably. Where streams are steep, accumulation of copper occurs where the slope flattens decreasing up stream even though the source of copper may be up stream (~~see Fig 2, Page 2~~). In the South Portland area, copper dispersion is mainly mechanical rather than chemical. The Holman field test failed in many places to respond to as much as 275 ppm copper as determined in the laboratory. This was not serious except that field crews were unaware of the anomalous nature of the sample until results were back from Vancouver Geochemical Laboratories Ltd. in North Vancouver.

The Holman field test was used as in the past but with one change - the dithizone was precipitated onto a filter paper in the Vancouver laboratory of Vancouver Geochemical Labs prior to going into the field. These dithizone papers contained enough on each paper to make 100 mls of field strength dithizone. This method cut down considerably the loss of dithizone through oxidation as well as providing a more convenient way to store and carry dithizone in the field.

Silver geochem was used this past season by our crews. The background varies in the different regions but is relatively high in the Kitsault River area. Values of 1.00 ppm and 1.5 ppm Ag are common.

Values greater than three times background were considered anomalous.

Where known Ag deposits occur, Ag values up to 8 ppm were obtained from the silts but usually were 2 to 3 ppm. One significant geochem anomaly ~~as~~ was picked up and remains to be checked out. ~~Geochemistry remains as one of the most useful tools in exploration, and we should therefore develop a good knowledge of field methods and problems in order to get the most out of our surveys.~~

part a test run <sup>was made</sup> on silts over the Eden deposit ~~was made to~~ to determine the magnitude of values which might be expected on a similar deposit and the distance which the copper might migrate. See Fig 2 Results are shown on ~~Fig 4~~.

Regional silt sampling is shown on Map 7.

DESCRIPTION OF AREAS PROSPECTEDNorth Portland Canal Area:

The North Portland Canal area lies from 6 to 18 miles south of Stewart on the east side of Portland Canal. Rocks are mainly andesitic and rhyolitic flows with interbedded narrow argillaceous sedimentary units. Diorite and andesite dykes, granodiorite, quartz diorite and quartz monzonite masses intrude the volcanic - sedimentary sequence. All rocks are cut by northerly to northeasterly steeply dipping faults.

There are a number of known mineral occurrences, all appear to be small and insignificant. The Georgia River Gold Mine~~x~~ is the only property that has a record of production. In 1937, 500 tons of Au-Ag-Pb ore were mined. Nothing has been done since <sup>the</sup> ~~that~~ mine closed in 1938. During the past season, our prospectors located three mineral occurrences - none were of any economic value.

a) Georgia River Section:

Georgia River flows southerly into Portland Canal 17 miles south of Stewart. Streams flowing from the north into the Georgia 1½ miles from its mouth showed anomalous Ni and Cu. This was expected since the streams sampled drain an area in which a known small Cu-Ni showing is present.

Two miles east of Blue Point, disseminated pyrite with chalcopyrite in black carbonaceous argillites occurs adjacent to the contact with a granodiorite intrusion. Sparse mineralization was not

found to be extensive. Nothing of interest was found on the North Georgia River. Only occurrence of any potential is held by Malispina Mines. Mineralization here consists of chalcopyrite, pyrrhotite and pyrite in replacement masses in shear zones and fracture fillings in andesite. Work is being done by Malispina to explore the prospect.

b) Mt. Brown Section:

On the south slopes of Mt. Brown near the toe of a hanging glacier, MoS2 was found in northerly and northeasterly faults or fracture zones. Molybdenite in the form of rosettes occur sparsely scattered on widely spaced fractures in a quartz monzonite intrusion. The intrusion is little altered and insufficient MoS2 was present to warrant additional work.

c) East Georgia River Section:

This area lies 6 miles south of Mt. Brown. Streams draining the contact between volcanic and intrusive rocks were silted and the ground prospected. The valley is covered by a dense growth of tag alder, devils club, and other undesirable plants, consequently the geology is sketchy. A large granodiorite boulder sparsely mineralized with MoS2 in widely spaced fractures was found. Efforts to find the source were unsuccessful although outcrops on steeper slopes are plentiful. Silt samples gave background values in MoS2 with one exception which gave 25 ppm over a background of 4 to 5 ppm. A search of the outcrops above the anomalous silt failed to find any MoS2.



Nothing of interest was found in the East Georgia River Section.

d) Mt. Guanton:

Two men checked out two aeromag anomalies north and northwest of Mt. Guanton. Rocks here are mainly andesite with minor interbedded argillites. No economic minerals were found. The anomaly can be adequately explained by magnetite in a basic dyke cutting the andesite.

e) Sutton River Section:

The upper Sutton River northwest of the Sutton Glacier follows closely the contact between granodiorite to the north and andesitic volcanic rocks to the south. The volcanic rocks are in part layered and contain narrow interbedded sedimentary units. Topography is extremely rugged and valley walls difficult to traverse. Large boulders of garnet epidote skarn cover much of the upper part of the river but there were no metallic minerals associated. Of academic interest was a cavity in a granodiorite boulder lined with well developed crystals of epidote.

A <sup>flat lying</sup> Cu-Pb-Zn occurrence was located west of Sutton Glacier on the west side of the river. ~~It~~ <sup>ing</sup> consists of chalcopyrite, galena and sphalerite in narrow bands in volcanic rocks. Mineralization is exposed on a near vertical cliff 300 to 400 feet above the valley floor. During the course of exploring the showing, the crew found it had been staked by Don Ross of Ketchikan, Alaska in May of 1969. It is a difficult prospect to evaluate because of the precipitous nature of the bluffs on

which it outcrops. It does not extend to the top of the bluffs which are possibly 500 to 800 feet higher than the showings but it has been traced intermittently by our crew and Mr. Ross for an estimated 1,500 feet along the cliff at the top of the talus. Maximum width across the mineralized stringers is 15 feet.

Mr. Ross advised that he is prepared to make a deal on the prospect. I suggest we take no further interest in it unless better looking mineralization is found by the owner.

#### South Portland Canal Area:

The South Portland Canal exploration area covers about 70 square miles. It lies to the east of Portland Canal 27 to 40 miles south of Stewart, B.C.

Geology differs from that to the north in that there is a great thickness of poorly developed pillow lavas and more sedimentary and schistose rocks. The area is underlain to the north and west by andesitic volcanic rocks with interbedded argillaceous sedimentary units and chlorite schists. The argillites dip moderately to steeply to the east. A narrow belt of serpentine extends in a northwesterly direction from a point  $1\frac{1}{2}$  miles west of Mt. Clashmore to Mt. Marshall. The south and east areas are mainly underlain by pillow lavas. These are in contact with argillaceous and sedimentary rocks which lie east of Long Lake, near Anyox. Extending in a south-southeasterly and north-northeasterly direction from Bonanza Lake is a band of chlorite schists with some adjacent sedimentary rocks.

South of Bonanza Lake, volcanic rocks are intruded by three small granitoid masses, diorite to quartz diorite in composition. Some MoS<sub>2</sub> was found in a quartz diorite plug one mile south-southeast of Bonanza Lake.

The area lying north of Bonanza Creek has numerous small copper occurrences, none of which appear to be of any economic interest.

Donahue Creek Section:

This area is underlain mainly by volcanic rocks with minor interbedded sediments. Contact with Coast Range intrusive rocks lies between Raw Point and Mt. Marshal and extends southeast to the headwaters of the east branch of Donahue Creek.

Small occurrences of copper were found on the east branch of the Creek and values of 100 to 125 ppm ~~exp~~ Cu were obtained in some silt samples. The small amounts of copper found in this area are considered sufficient to give 100 ppm.

~~As analyzed and reported~~

South Donahue Creek Section:

On the northeast side of the south branch of Donahue Creek approximately  $1\frac{3}{4}$  miles east-southeast of its confluence with Donahue Creek the crew discovered a 2-foot wide quartz vein with massive chalcopyrite. The showing is near the top of a 300 to 400-foot vertical cliff striking near parallel to the cliff. Doug Fraser was the only man brave enough to climb on to this cliff to examine it but was unable to reach the actual showing. He could however see well enough to estimate the width and strike

of the vein. It is about 2 feet wide and extends for several feet along the cliff. Float picked up at the bottom revealed massive chalcopyrite in vuggy quartz veins. This is similar to that material in the Maple Bay deposits four miles to the south-southwest. An E.M. traverse was run along the top of the cliff with negative results. The deposit could not be traced to the northeast. However, a second quartz vein was found over the ridge to the northeast about 1/2 mile from the cliff showing. The quartz vein type mineralization is not considered of any interest.

Anomalous copper was found in silts on the south side of the creek directly across from the cliff showing. These silt values were received after the camp had broken for the season, consequently, no follow-up work has been done. Some copper in quartz was found in these creeks and it is felt that since this area is near the Maple Bay deposit, (on the opposite side of the ridge) any mineralization found would be in quartz veins. No follow-up work is planned.

A small Pb occurrence was located at the head of the South Donahue but was too small to be of interest.

#### Mt. Clashmore Section:

The south and western slopes of Mt. Clashmore are distinctly copper anomalous. Chalcopyrite occurs in small shear zones and occasionally in fractures in scattered occurrences over much of the area. The most significant mineralization found is in a 2-foot wide shear zone on the northwest side of Mt. Clashmore. Mineralization was traced along the shear

for about 100 feet. This area is about 80% outcrop. Underlying rocks are andesitic in part somewhat schistose. These are intruded to the northeast and west by a tongue of granodiorite, that projects southward from the main intrusion to the north. None of the mineral occurrences found warrant further work.

Bonanza Lake Section:

The area surrounding Bonanza Lake and to the south and east is underlain by andesitic volcanic rocks that are in part schistose and in part poorly formed pillow lavas. Several small occurrences of chalcopyrite, some very sparsely mineralized were located. None were sufficiently encouraging to stake. Sparse MoS<sub>2</sub> in the form of rosettes was found in a quartz diorite intrusion situated about one mile southeast of Bonanza Lake. There was insufficient mineralization to justify further work.

Mt. Tournay:

Silt sampling outlined an anomalous area with values up to 275 ppm copper. Follow-up prospecting ~~with values up to 275 ppm Cu~~ showed this to be finely disseminated chalcopyrite irregularly scattered through slightly schistose volcanic rocks. The area was well prospected with no encouraging results. No further work is to be done.

West Kitsault River Section:

This area lies along the southeastern margin of the Cambria Snowfield from the upper Kshwan River, 8 miles west-northwest of the Dolly Varden Mine north to Flat River. It extends southward to include both Kitsault and Kinskuck Lakes. The area is underlain mainly by volcanic and sedimentary rocks of both the Stewart and Bowser groups. The lowermost volcanic unit is thought to be part of the Stewart (Hazelton) group of Upper Triassic age. The overlying sedimentary unit and volcanic rock which in turn overlie <sup>the sedimentary rocks</sup> ~~it~~ mark the cessation of a period of volcanic activity and the beginning of a period of sedimentation which produced the thick sequence of greywacke, argillites, quartzites and volcanic sandstones of the Bowser Group, ~~these~~ <sup>the</sup> which overlie the Stewart rocks.

Intruding the above rocks are small leucocratic intrusions, ~~small~~ diorite and quartz monzonite plugs and <sup>the</sup> main Coast Range granodiorite.

Sedimentary rocks have a general north-easterly dip. This trend is interrupted in places as at the head of White River, where sediments are tightly folded. West of Kinskuck Lake rocks are folded into a broad north-northwesterly trending anticline. The crest of the anticline follows <sup>a body of</sup> an augite porphyry. <sup>that is thought to be intrusive. It is a dark green</sup> This rock is volcanic, in places <sup>rock with up to 22% augite phenocrysts. In places it is fragmental, and</sup> fragmental. <sup>and</sup> The fragments ~~are~~ partly rounded. This may be because of <sup>in part</sup> reworking???

This suggests some reworking or movement <sup>while the interfragment matrix was still fluid or semi fluid.</sup> Faulting occurs in northwesterly to northeasterly directions and most are steeply dipping.

Geology along the Cambria Snowfield is shown on map 8, that near Jade & Kinskuck lakes on map 8.

Upper Kshwan:Section:

On the south side of the Upper Kshwan River near a contact between volcanic and sedimentary where these have been intruded by granodiorite a little chalcopyrite was found and three small boulders of Zn-Pb float. Source of float was not located and the chalcopyrite was unimportant. Silts gave values up to 170 ppm over a background of near 80 ppm where the chalcopyrite was found. Silver and lead values were normal for the area. Nothing of significance was found.

Black Bear Creek Area:

This section lies west of Kitsault River three to four miles west of Dolly Varden. Rocks are mainly argillites and volcanic rocks which are cut by westerly to northwesterly green dykes. ~~XXXX~~ Argillites form the lowermost unit and outcrop mainly in valley bottoms; volcanic rocks form ridges. Some pyrite occurs in the rocks but no copper was seen. Silts show high copper background - 56.1 ppm (eliminating values <sup>calculation used to find background</sup> over 100 ppm). Including all values, copper average is 88 ppm. Maximum value obtained is 163 ppm. One sample gave 55 ppm Mo, however no MoS<sub>2</sub> was found. The 163 ppm Cu is not considered significant where background is high. Nothing of interest was found.

Homestake Creek Section:

Area around the Homestake and adjacent properties was examined and stream silts tested but no new mineral occurrences were found.

Known deposits occur around the peripheries of a north-northwesterly elongated leuco quartz-rich intrusion. Mineralization lies mainly along contact of the intrusion associated with shear and breccia zones.

Mineralization occurs in faults and brecciated zones with quartz calcite and/or barite gangue and disseminated in both intrusion<sup>ding</sup> and intruded rocks.

#### Homestake Mine:

Mineralization in the Homestake Mine consists of fairly massive pyrite and chalcopryrite with galena and sphalerite along a northwesterly trending shear zone which dips steeply to the northeast ( $50^{\circ}$  to  $80^{\circ}$ ). Maximum width to the zone is 30'. Massive sulphides, mainly pyrite in quartz-carbonate-barite gangue occur in lenses that pinch and swell along strike.

Although spectacular mineralization can be found in individual lenses, the overall amount of chalcopryrite, galena and sphalerite is scattered and lensy. In general, mineralization is sparse.

#### White River - Flat River Area:

This region which lies along the fringes of the Cambria Ice field north of the Kitsault Lake area is mainly underlain by argillites, greywacke and volcanic sandstones. These have been intruded by a small quartz monzonite plug and a small apophysis off the plug. Other instrusions include felsitic dykes and sills. Associated with the quartz monzonite



plug is a little Mos2 in and along fractures. This occurrence is being held by Kennco Explorations.

Nothing of interest was found.

Kinskuck Lake - Jade Lake Section:

The area is underlain by sedimentary rocks of the Lower Bowser or upper Stewart Group which are in turn overlain by andesitic volcanic rocks. What appears to be an intrusive augite porphyry folds sedimentary rocks into a north-northwest trending anticline. <sup>(see map 9)</sup> Some of the augite porphyry is fragmented with some of the fragments showing rounding. This would suggest that some reworking has taken place.

This area has a much higher copper background than most areas examined - 100 ppm ± is common. Copper values in excess of 300 ppm here are considered anomalous. <sup>(see map 10 page — for geochemistry)</sup>

One original or new mineral occurrence was found on the west side of Kinskuck Lake. Minerals in this occurrence have not been definitely identified, but samples are at UBC for positive identification. This occurrence in itself is unimportant, however three streams draining into Kinskuck Lake where this occurrence was found gave values of 650 ppm, 2,000 ppm, and 2,150 ppm Cu. The first and last creeks ~~xx~~ where anomalous values were obtained are about 1,200 to 1,500 feet apart. Anomalous silts were taken during the last three days of the season, ~~x~~ consequently assay results of silt samples were not known until after the camp was closed. Consequently, ~~no~~ <sup>DF</sup> follow-up work has been done. This is planned for 1970. Type of mineralization that might be expected would be similar to the silver deposits of Dolly Varden.

Bitter Cr. Area Section  
Roosevelt Creek - Ore Mountain Section:

This section lies north and east of Stewart in an area underlain almost entirely by sedimentary rocks. These are cut <sup>by</sup> diorite, andesite and lamprophyre <sup>dykes</sup> as well as small quartz diorite and ~~dykes~~ and quartz monzonite intrusions. Several high-grade Ag-Pb-Zn deposits occur in this area, four were examined. No new showings were found. Mineralized quartz veins carrying chalcopyrite were found on the western tributary of Roosevelt Creek. There was not enough copper to be of interest. A boulder 18" by 12" was found in the western branch of the Roosevelt near its confluence with the main creek which contained massive tetrahedrite and galena with some sphalerite. A similar boulder was found over the ridge 8 miles to the west. Several days were spent trying to trace the float with no luck. It seemed likely that since the boulders were on both sides of the ridge, the likely spot would be on top. Unfortunately, this is permanently covered by ice and snow. *Geology is shown on map II Bitter Creek.*

Other small veinlets of massive Pb were found along dyke contacts or small faults, but none warranted further examination. Anomalous silts were caused by small occurrences or known deposits. No further work recommended here.

Meziadin Lake:

Anomalous copper was obtained from silts in a creek near the west end of Meziadin Lake 2.5 miles northeast of Stewart. Cause of the high copper was found to be disseminated chalcopyrite with pyrrhotite in

a small diorite intrusion cutting volcanic rocks. The small intrusion is implied by talus which at one point consists almost entirely of diorite boulders, some up to 8 feet in diameter. Above and below this point, the number of diorite boulders becomes less and volcanic boulders more. This suggests that there is a small underlying intrusion. Mineralization was sparse, possibly less than 0.5% total sulphides of which pyrrhotite comprises 70% to 80%. No further work is planned.

Todd Creek:

Todd Creek is about 20 miles north-northeast of Stewart, B.C. Some prospecting was done to check out areas in which there were small intrusions. Copper was found in three places, two occurrences were staked. The third occurrence consisting of chalcopyrite with lead and zinc in <sup>a</sup>brite veins was small and mineralization sparse. The other two are described below as: a) The Bern Claims and , b) the Todd Claims.

Bern Claims:

The Bern property consisting of nine located claims is on the west side of Todd Creek about 10 miles from its confluence with Bowser River (See fig <sup>13</sup>~~1~~, Page \_\_). The mineralized area lies between elevations 4,500 and 5,000 feet. A permanent snowfield and glacier covers the western three claims.

Underlying rocks are bedded tuffs, lithic tuffs, agglomerates and andesitic flows that have been intruded by an intensely altered, brecciated and pyritized granitoid mass. A petrographic report by Tom Richards describing the basic rock type is in Appendix I. (For geology see Map <sup>13</sup>~~10~~ in pocket.)

*check map #*

The granitoid intrusion is a bleached quartz-plagioclase feldspar porphyry. It is intensely altered to a greenish white nondescript "unintrusive" looking rock. Sericite, carbonate, kaolinite and serpentine (?) are main alteration minerals. Within the intrusion are areas of brecciation. Fragments are in places subrounded which suggests reworking of fragmented rock before healing. Finely disseminated pyrite cubes occur throughout the intrusion. Near the easterly contact the intrusion is a white bleached fissile rock. This rock <sup>is probably</sup> ~~was first thought to be~~ of volcanic origin. ~~It is now classified with the intrusions.~~

Mineralization consists essentially of massive veins of pyrite, some up to 8" ~~or 1~~ foot in width, cutting the quartz-plagioclase porphyry. Pyritized zones which are in places criss-crossed by pyrite veins are easily picked out by limonitic gossans. Individual areas of intense pyritization within the intrusion are from 200 square feet or less to 20,000 <sup>square</sup> feet. Chalcoppyrite occurs sparingly. Near the southeast intrusive contact narrow veins of massive chalcoppyrite cut volcanic rocks. There are 4 veins 1" to 3" wide extending along the bluff for 30 feet. Vein contacts are sharp.

Massive pyrite follows prominent and lesser breaks. It was first considered that the so-called intrusions were possibly an alteration of volcanic rock and that the pyrite formed a halo. Petrographic work contradicted this <sup>theory</sup> ~~idea~~ indicating clearly the granitic character of the intrusion. From the lowest outcrop of intrusion to the highest, difference in elevation is about 700 feet. This essentially exposes a 700-foot vertical section of the intrusion.

There is a  
 Because of the lack of chalcopryrite with no evidence that  
 the amount <sup>could</sup> ~~may~~ increase, <sup>find it difficult to</sup> ~~I cannot recommend further work.~~ <sup>would be of no use</sup> ~~E.P. no good~~  
~~because of pyrite. Leaves only drilling. Drilling with Winkie only gives~~  
~~200-foot section.~~ ~~I recommend we~~ ~~and therefore~~  
 which leaves no justification for additional work.  
 No further work, therefore, is planned and it is  
 recommended that we drop allow the claims to lapse.  
 b) Todd Claims:

The Todd <sup>claims are</sup> ~~property is~~ near the valley floor about two miles  
 south of the Bern property. Mineralization consists of massive chalco-  
 pryrite in a quartz-carbonate gange in a brecciated intrusion. The zone  
 of brecciation lies along a northerly fault that cuts an altered intrusive  
 rock. Maximum width is 30 feet (estimate) and length possibly 100 feet  
 to 150 feet. The zone is lense-shaped, narrowing into a 6" to 1-foot  
 wide fault. Chalcopryrite occurs at several intervals along this fault.  
 Core from a previously drilled hole near the outcrop intersected 30 feet  
 to 40 feet of <sup>greater</sup> ~~less~~ than 1% copper. Location of the hole could not be  
 found but is likely cutting the mineral zone.

A picked sample was taken to determine what other values occur  
 with the copper. Results were as follows:

Sample #504                      Au = 0.29 oz                      Ag = 0.3 oz                      Cu = 4.94%

<sup>is to be</sup>  
 No Further work ~~should be done on this prospect in the form~~ because  
 of the limited ~~nature~~ <sup>extent</sup> of mineralized breccia.  
~~of: a) geological mapping, b) E.M. Survey, and if warranted, drilling~~  
~~test holes with a Winkie drill.~~

SUMMARY AND CONCLUSIONS:

Considering the adverse weather under which the operation was  
 conducted the field crews covered probably 75% of the original area

outlined. This I would consider good.

Five areas were explored within the original limits as outlined. These were: a) the North Portland Canal, b) the South Portland Canal, c) the Kitsault River, d) the Roosevelt Creek - Ore Mountain, and e) the Todd Creek areas. Airborne magnetometer work was flown over a) and b). In the north area several anomalies were checked - none were related to sulphide mineralization. In the south area, ~~seven~~ <sup>six aeromag</sup> anomalies were checked; ~~six~~ <sup>five</sup> have been eliminated, one remains to be further checked.

Several mineral occurrences were found, two, both on Todd Creek, were staked. Massive chalcopyrite in a two-foot quartz vein was found on Donahue Creek and chalcopyrite in one two-foot wide shear located on Mt. Clashmore. Neither justifies further work. MoS<sub>2</sub> was found on Mt. Brown in the North Portland Area, but was sparsely scattered on a widely spaced fractures. No further work is justified. One small copper-lead (?) occurrence was found on the west shore of Kinskuck Lake. Three streams near this occurrence gave values of 650ppm, 2,000 ppm and 2,150 ppm copper. Follow-up work is planned here.

Adverse weather prevented flying the third proposed area with the aeromag survey south of B.C. Moly. This will be left to be done in the future.

In conclusion, I must say the project was not a complete wipe-out but was, to some extent, disappointing. ~~Three~~ <sup>Two</sup> areas, Anomaly #1 on Portland Canal, <sup>and</sup> the geochem anomaly on Kinskuck Lake, and the showings on Todd Creek, require further work.

Recommendations;

- 1) Run an I.P. traverse across Anomaly #1 to further check the aeromag anomaly.
- 2) Check out the geochem anomaly on Kinskuck Lake.
- 3) ~~Further check the Todd properties to determine if Winkie drilling is justified.~~
- (4) Drop both the Bern + Todd claims and advise Wilf Christian of our intention to drop the Todd claims.