GEOLOGICAL ASSOCIATION OF CANADA

CORDILLERAN SECTION

and

MINERAL DEPOSITS DIVISION

COPPER MOUNTAIN - PHOENIX TOUR

SOUTHERN BRITISH COLUMBIA

April 20th to 22nd, 1982

Tour Leaders and Guide Book Authors:

B.N. Church and V.A. Preto, B.C. Ministry of Mines & Petroleum Resources
W.H. Mathews, Dept. of Geology, University of B.C.
J.W.H. Monger, Geological Survey of Canada
K.C. Fahrni, Canadian Geoscience Corporation; R.H. Seraphim, Consultant

INTRODUCTION

This guide book has been prepared to support a three-day bus tour from Vancouver to Princeton to Grand Forks and return to Vancouver. The tour has been arranged jointly by the Cordilleran Section and Mineral Deposits Division of Geological Association of Canada to permit geologists to review the geology across the southern part of B.C. with particular emphasis on the mining camps of Copper Mountain and Phoenix.

The text has been partly assembled from three previous guide books which were prepared for the International Geological Congress in 1972, excursions A05-C05, A09-C09, A03-C03, and GAC Field Trips #5 and #6 Guidebooks of 1977. All five of the guidebooks are still available at the Geological Survey Publications office in Vancouver. Additional material has been provided by Dr. Neil Church of the B. C. Ministry of Mines and Petroleum Resources and by Dr. Robert Seraphim, consultant. Previously published reports on Copper Mountain and Phoenix areas are included for reference. Information for Robert Mines, Dankoe Mines and Banbury Mines has been obtained from the companies and from reports in the George Cross Newsletter, as well as from the Annual Reports of the B. C. Ministry of Energy, Mines and Petroleum Resources. The trip was conceived by Vic Hollister. Arrangements for transportation and accomodation were taken care of by Bob Hewton, and Jack Armstrong provided the backup for the financial considerations. Typing and assembly have been done by Canadian Geoscience Corporation staff. Thanks are due to Vic Preto for reading the proofs and to the several mining companies for permission to visit their properties.

Keith C. Fahrni, P. Eng
Editor

CONTENTS

DAY 1

SECTION FROM VANCOUVER TO PRINCETON

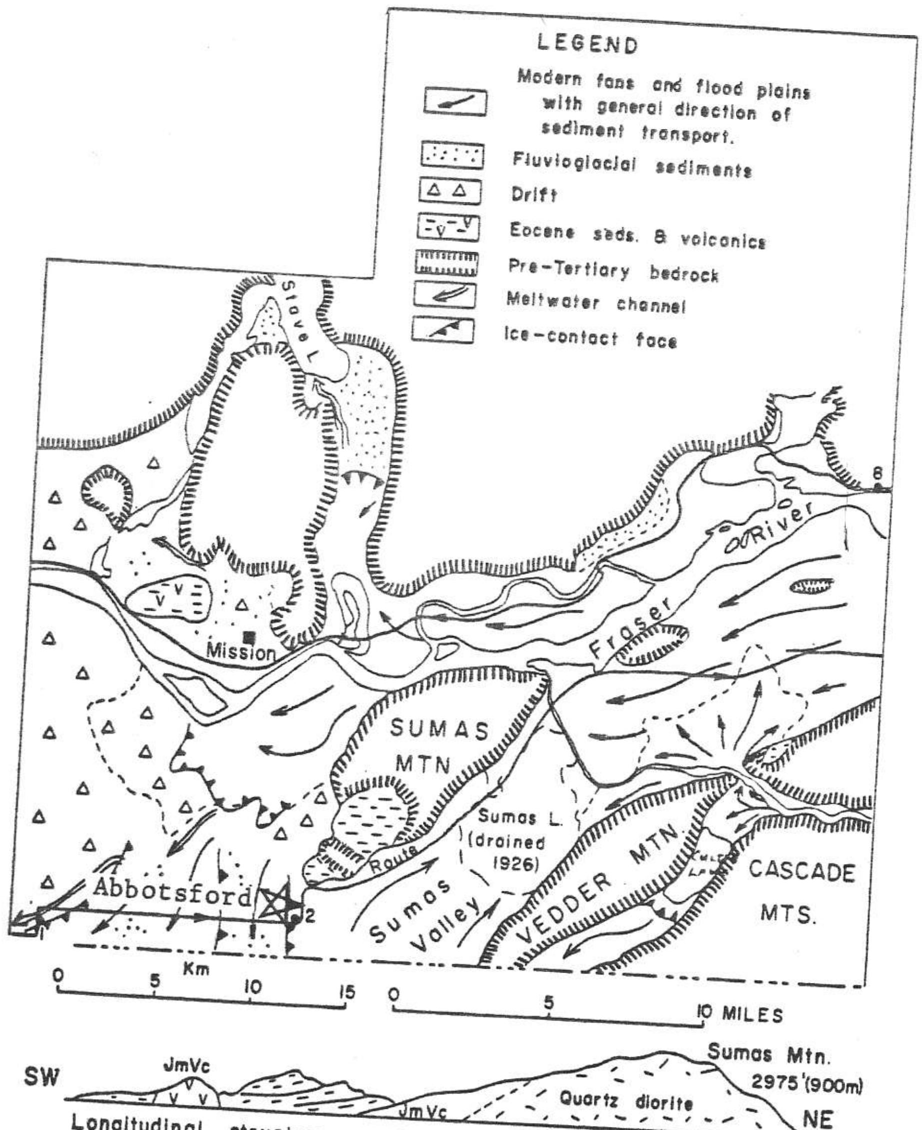
Kilometers

0 Start from Vancouver and travel by Highway No. 1 from the Tertiary Kitsilano formation of Vancouver into the Fraser system, to cross the river at Port Mann Bridge. The route then traverses a series of rolling uplands which rise to elevations of about 100 m and comprise complex accumulations of Pleistocene glacial and non-glacial sediments capped with glacio-marine diamicton or by their wave-washed residues. Between the uplands is a network of broad valleys filled to depths of some hundred of meters (ca. 300 m) with marine to estuarine sediments of early postglacial age. As shown by drilling, Eocene and Miocene sediments underlie this area, but they have no surface exposures.

74 Abbotsford - North of Highway. This agricultural center lies at the edge of Sumas Valley through which the Nooksack River, now in its own channel to the Pacific, once flowed to join the Fraser. An accompanying sketch map shows the various post-glacial action in the Eastern Fraser Lowlands.

85 Sumas Mountain and Vedder Mountain. Sumas Mountain, northwest of the highway, rises gradually from the southwest, where it is underlain by Eocene continental sediments, to the northeast (summit elevation 900 m) where it is underlain by more resistant Mesozoic metavolcanic and granitic rocks. The Eocene sediments, though warped and faulted, rise to the northeast at a general angle only slightly steeper than that of the present topography, and it is likely that the upper southwesterly-facing slope of the mountain is essentially an exhumed Eocene surface stripped of its less resistant sediments. The Eocene succession midway along the length of the mountain includes several thin non-commercial coal seams. The underclay of one of the seams has been mined for many years by room and pillar methods for the manufacture of firebrick in a factory at the base of the mountain. Other clay seams in this vicinity have also been quarried for the production of structural tile, building bricks, etc.

Vedder Mountain, 6 km to the southeast, on the opposite side of Sumas Valley, is underlain by a fault-bounded block of foliated quartz diorite, epidote, amphibolite and garnet-mica schist, flanked on the northwest (at the foot of the slope) by meta-sediments of unknown age, and on the southeast by Mesozoic arenites, pelites and conglomerates



Longitudinal structure section of Sumas Mtn.

which form the crest and far slope of the mountain. The northeasterly structural trend so notable here, is restricted to the western Cascade Mountains; elsewhere northerly to northwesterly trends prevail. A wholerock Rb-Sr age of 258±5 million years has been obtained frm garnet-muscovite schist of the metamorphic block. Curiously, this age (early- to mid-Permian) corresponds to a timeof accumulation of nearly conformable succession of Permian sediments and Volcanic rocks in the Cascade Mountains only a few kilometers to the east where, moreover, subsequent metamorphism has been of very low grade.

Continuing northeasterly on Highway 1, the route crosses a prehistoric landslide from the slopes of Mount Cheam (elevation 2117 m). Landslide debris forms a series of mounds and ridges up to 60 m high which describe a series of crude arcs centered about Bridal Veil Falls, south of the road. The debris, which includes blocks up to 5 m in diameter, embedded in a poorly sorted argillite-rich matrix, rests on fluvio-glacial gravels and is covered by a voluminous gravel fan from Bridal Creek. It is also overlain by a deposit of marl precipitated on the floor of a former lake almost 0.5 km in diameter, ponded amid the landslide debris. The landslide deposit has an area of about 8 km^2 and an estimated volume of many tens of millions of cubic meters.

123 BC Hydro Waleach Generating Station. A tunnel through the mountain and a pentstock to the power plant delivers high pressure water to a modern, almost completely automated power plant which is used for peak load adjustment in the Vancouver system.

Continuing, the road climbs onto a granitic tock spur. A small quarry lies west of the road. Quartz diorite exposed here is part of the Mount Barr complex from which five K-A dates of between 16 and 21 million years have been obtained (Baadsgaard et al, 1961; Richards and White, 1970). The Mount Barr complex, 20 km across and about 250 km^2 in area, is exposed from river level to mountain tops 2000 m above and retains its granitic texture for the full vertical range with no signs of a former cover. Some 32 km to the south and southeast, stratified dacite, andesitic and trachyandesitic flows, breccias and tuffs overlie and are cut by granitic plutons believed to be Eocene and late Oligocene age, slightly older than the Mount Barr complex (Misch, 1966) and these may represent the top of a former magma chamber which broke through to the land surface. However, no cover of similar volcanic rock or of any preplutonic rocks survives here.

Continuing to Hope (junction of Highway 1 and 3) the route passes through a more constricted section of the Fraser valley in which the floodplain is rarely more than 2 km wide and the steep valley walls rise generally 1300 to 1500 m to rounded sumits or shoulders. For the first 4.8 km more or less metamorphosed upper Paleozoic rocks crop out, and these are followed by quartz diorite and hypersthene - augite diorite of the Spuzzun intrusions. Though K-A ages of 77 to 103 million years have been obtained from these intrusions, the joint patterns are remarkably simple.

149 Hope - Junction of Highway #1 and Highway #3. For the first 10 km beyond Hope (on Highway #3) the route passes through the Hope plutonic complex, comprising quartz monzonites and quartz diorites yielding K-A dates of 35 to 41 million years, thence continues southeasterly up the valley of Nicolum Creek through chert and argillites of Paleozoic (?) age dipping steeply southwest (McTaggart and Thompson, 1967). Near the head of the valley, the creek has locally been made to cut into bedrock of the southwest wall of the valley by the presence of an accumulation of sand, gravel and boulders brought in by an old stream which followed the ice-margin and entered Nicolum Valley from the north. Numerous exposures of the ice-contact face of the kame terrace deposit resulting from the action of the old stream occur on the east side of the highway. At the head of the valley the kame terrace is overlain by debris of a prehistoric landslide and this, in turn, by debris of the 1965 Hope landslide.

160 Hope Landslide - STOP. On January 9, 1965, about 130 million tonnes of volcanic greenstone rubble swept southwestward down the mountain side onto a valley floor composed of swamp, meadow, ancient landslide debris, fluvio-glacial sand and gravel, and a small lake. A mixture of slide-rock, mud and lake water was driven up the opposite slope; some returned to come to rest on the valley floor against the lower slopes of the slide; much was deflected northwestward and rushed more than 5 km down valley as a mud-flow or spilled eastward as a soupy layer generally less than 10 m thick for as much as 1 km (Mathews and McTaggart, 1969).

Two earthquakes, about 3 hours apart, of magnitude 3.2 and 3.1, occurred apparently at the time of the slide - epicentres were placed within a mile of the slide.

The slide surface consists of volcanic greenstone, striking parallel with the valley and dipping 45° to 60° S.W. The greenstones are massive flows, obscurely layered but strongly jointed and locally faulted. The volcanic succession is overlain by ribbon chert, which is well exposed along the southwest wall of the valley, about 100 m from the parking area. Greenstone and chert, both of the Hozameen Group, are intruded by buff-colored felsitic sheets and irregular bodies, which are easily visible on the slide surface. Many of these dip about 30° SW.

It is reasonable to suppose that the slide was triggered by the earthquake. The surface along which the slide occurred seems not to be an original flow contact; primary volcanic features are very obscure in the slide area but the general attitude of the rocks is steeper than the slide surface. The somewhat irregular slide surface was likely in large part controlled by a combination of the contacts between felsite sheets and greenstone.

190 Skagit Bluffs. Here the Hozameen fault crosses the road, separating the Paleozoic Hozameen cherts and volcanics on the west from the Ladner Creek sediments of Jurassic age. The Hozameen fault is the locus of a number of gold occurences to the northwest where a serpentine belt occurs along the fault. The Carolin Mine is the most important of these. Invermay Mine, a lead zinc vein and Giant Copper, a breccia pipe, are within a few miles but are related to granitic intrusions in the Ladner Slates of the Dewdney Creek series rather than to the fault.

216 Manning Park Recreation area. Pinewoods Lodge is a ski and nature study area. Continuing, the road follows the Similkameen River. Where the road crosses the Pasayten fault the Eagle Batholith is encountered. Some mineralization occurs on the east side of the batholith with discontinuous veins of quartz in schistoze rocks of the Triassic Nicola Formation.

231 Similkameen Falls. The Pasayten River joins the Similkameen here. Continuing, the road climbs to the top of a Tertiary lava plateau the extension of which can be seen to the east of the river on Placer Mountain. From the summit, the road gradually drops, passing some outcroppings of agglomerates and sandstones until it begins its descent to Whipsaw Creek.

268 Similkameen Mine concentrator and offices. The plant is built on monzonite and syenite of the Lost Horse complex. Across the Similkameen River are bluffs of diorite of the Smelter Lake Stock overlain by Middle Eocene Princeton volcanic flows and breccias.

The suspension bridges across the river support the ore conveyor from Copper Mountain and the tailings pipeline to Smelter Lake. The bold, gray bluff to the southeast of the bridge is a Tertiary intrusive plug of hornblende andesite porphyry.

The Similkameen pits, about 1,500 m south of the plant, roughly follow, and in part include the contact between the Lost Horse intrusives and Nicola volcanics. A description of the Ingerbelle deposits can be found in Fahrni et al (1976), Macauley (1973), Preto (1972) and Preto (1968). The first of these publications is enclosed in this guide book.

The Ingerbelle Mine has produced 69,201,000 tons of ore at an average grade of 0.40% copper with recovery of 0.005 ounces of gold and 0.02 ounces of silver per ton. A low grade stock pile of 10.7 million tons remains near the pits. Feed for the concentrator is being transported from Copper Mountain by truck to a crushing plant below the pit area with conventional conveyor connection to the new suspended belt conveyor across the river.

The milling is at a rate of 22,000 tons per day. About 300 now are employed at the mill and mine. Reserves at Copper Mountain have been calculated as sufficient to support the operation for over 20 years at current rate of mining.

273 Whipsaw Creek lies at the start of the Middle Eocene Princeton Basin. Princeton coal was mined just northwest of the creek at the Blue Flame Mine. Road cuts south of Whipsaw Creek are in Nicola flows and breccias, locally intensely faulted and sheared. Continuing, some outcrops of sandstone and coal formation can be seen in roadside cuts. As the highway descends into Princeton at the junction of the Tulameen River with the Similkameen , it crosses one of several terraces of Pleistocene fluvio-glacial gravels and sands which have provided homesites for employees of the mine.

282 Princeton - LUNCH STOP. A good section of Princeton Tertiary sediments with some coaly beds is exposed in cuts behind the Villager Motel and the Bus Depot.

284 Turn-off from the Highway to Copper Mountain. The road heads south and roughly follows the eastern side of the Middle Eocene Princeton Basin. Rocks exposed along and near the road are volcanics of the Lower Volcanic Formation which forms the base of the Princeton Group.

293 Wolf Creek - Smelter Lake Tailings Dam Control Station.

A small stagnant lake between high walls was enclosed by sands dams at each end and forms the repository for tailings from the Similkameen Copper Mill.

300 Voight's Camp and entrance to Lost Horse Gulch. In the early prospecting days of Copper Mountain, Emil Voight had his camp here and work was done at several places on an east-west trending fracture and shear zone in diorite of the Voight stock, mineralizd with specular hematite, chalcopyrite and pyrite. The gold content in this unique zone was also considerably higher than that of Copper Mountain ores.

The Voight and Smelter Lake stocks are part of the Copper Mountain intrusions and consist entirely of diorite very similar to the outer phase of the Copper Mountain stock.

302 Copper Mountain Mine Office. The Copper Mountain Camp straddles the Similkameen River and consists of a number of porphyry-type deposits which occur mostly in a narrow belt of altered Upper Triassic andesitic and basaltic volcanic rocks sandwiched between the Copper Mountain Stock to the southwest and the satellitic Lost Horse monzonite-syenite complex to the northeast. Rock alteration and mineralization are associated with the latter rock suite and vary somewhat between Ingerbelle and Copper Mountain.

Pit #2

This pit lay along and immediately south of the contact between the Lost Horse Complex and Nicola volcanic rocks. Most rocks exposed in the pit area are fragmental Nicola rocks in various stages of alteration. The pit is located at the centre of a newly outlined ore zone that will soon be mined. Typical alteration and mineralization of the volcanics, some of which preserve original textures, are displayed in the pit, as well as several large faults, sulphide-bearing veins, post-mineral felsite dykes and, in the northeast corner of the pit, a pipe of mineralized intrusive breccia that is a border phase of the Lost Horse Complex to the north. Approximately 1.7 million tons of ore grading 0.7 per cent copper were taken from this pit during the latter years of the Granby mine operation.

Pit #5

A brief stop will be made at this pit area to examine bornite mineralization in fragmental volcanics. The "North Mine Break" crosses the south end of the former pit in an east-west direction.

Pit #3

Excellent development of Dolmage's (1934) "Ore Fracture" in finely bedded tuff can be seen in this pit area. Pre-mineral diorite dykes and post-mineral felsite dykes are also well-displayed.

Pit #7

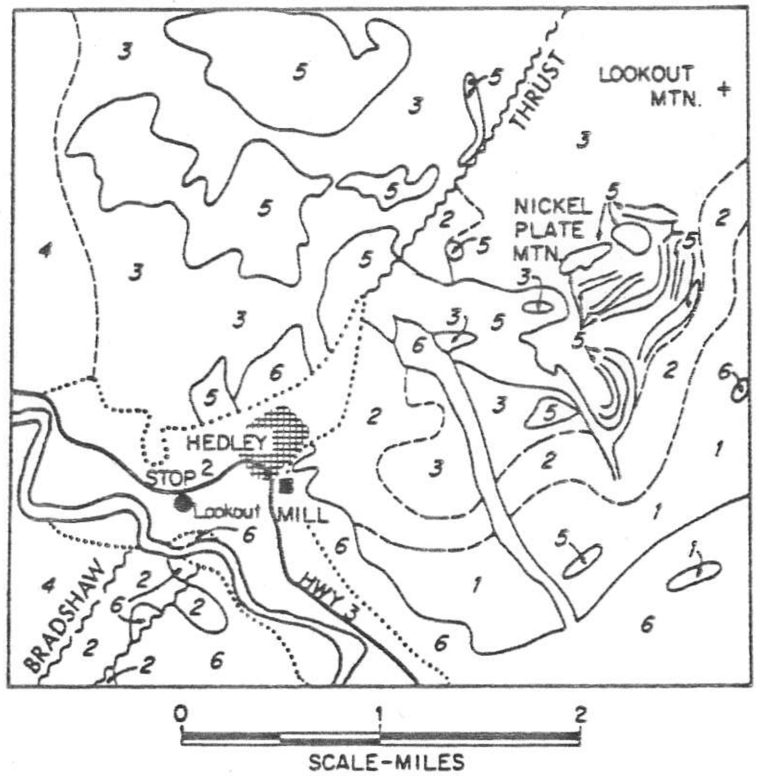
This Pit, together with Pit #1, is part of a newly developed ore zone. Mineralization in this larger orebody consists mostly of chalcopyrite and pyrite, but in Pit #7, between the Copper Mountain Fault and the stock contact to the South, mineralization consists typically of bornite and chalcopyrite fracture coatings in fragmental volcanics and tuff. Pyrite is very rare or absent. South of the pit, well bedded, gently dipping tuffs are cut by steeply dipping fractures and shoots of alteration which parallel the stock contact.

Return to Princeton for the night.

DAY 2

SECTION FROM PRINCETON TO GRAND FORKS

Kilometers	
0	Bridge on Similkameen River at Princeton.
	Coarse grained Princeton arkose and beds of sub-bituminous coal are exposed in old workings and road cuts just east of the bridge.
1	Impounded Copper Mountain tailings from the old Allenby concentrator.
3	Bluffs to the south are mostly Middle Eocene Princeton volcanics.
5 to 6	Massive Nicola flows and breccias are cut by northerly-trending pink granitic dykes which are similar to the "mine dykes" of Copper Mountain.
8	Dump of copper prospect southwest of highway. A fissure vein on a felsite dyke contact in Nicola volcanics.
9 to 30	Granitic rocks of Jurassic Okanagan Batholith.
31	Silver Creek Bridge. Road to Banbury Mines.
34	Steeply dipping, warped argillites and limy argillite of Henry formation, cut by a 2-foot dyke. Minor folds and some disseminated pyrite. The Henry Formation is the uppermost in the sedimentary succession at Hedley and consists mainly of argillite, tuff and impure limestone. Rice (1947, p.14) states that these sediments pass conformably into volcanic rocks of what Bostock (1940) called the Wolfe Creek Formation, which includes volcanic rocks such as are found at Copper Mountain.
35	Folded sediments of the Henry Formation to the southwest.
36	More Henry Formation sediments cut by a small dyke on northeast side of highway.
38	STOP 1 - Hedley Viewpoint.
	The cliffs near the town of Hedley afford by far the best exposures of a well-developed sedimentary succession some



JURASSIC OR YOUNGER

6 GRANODIORITE

5 DIORITE, GABBRO

UPPER TRIASSIC

4 HENRY FM. - BLACK ARGILLITE, TUFF, IMPURE LIMESTONE.

3 HEDLEY FM. - LIMESTONE, QUARTZITE, CHERTY QUARTZITE, ARGILLITE, CONGLOMERATE, BRECCIA, TUFF.

2 SUNNYSIDE FM. - LIMESTONE.

1 REDTOP FM. - LIMESTONE, CHERTY QUARTZITE, SILICEOUS ARGILLITE, TUFF, SOME BRECCIA.

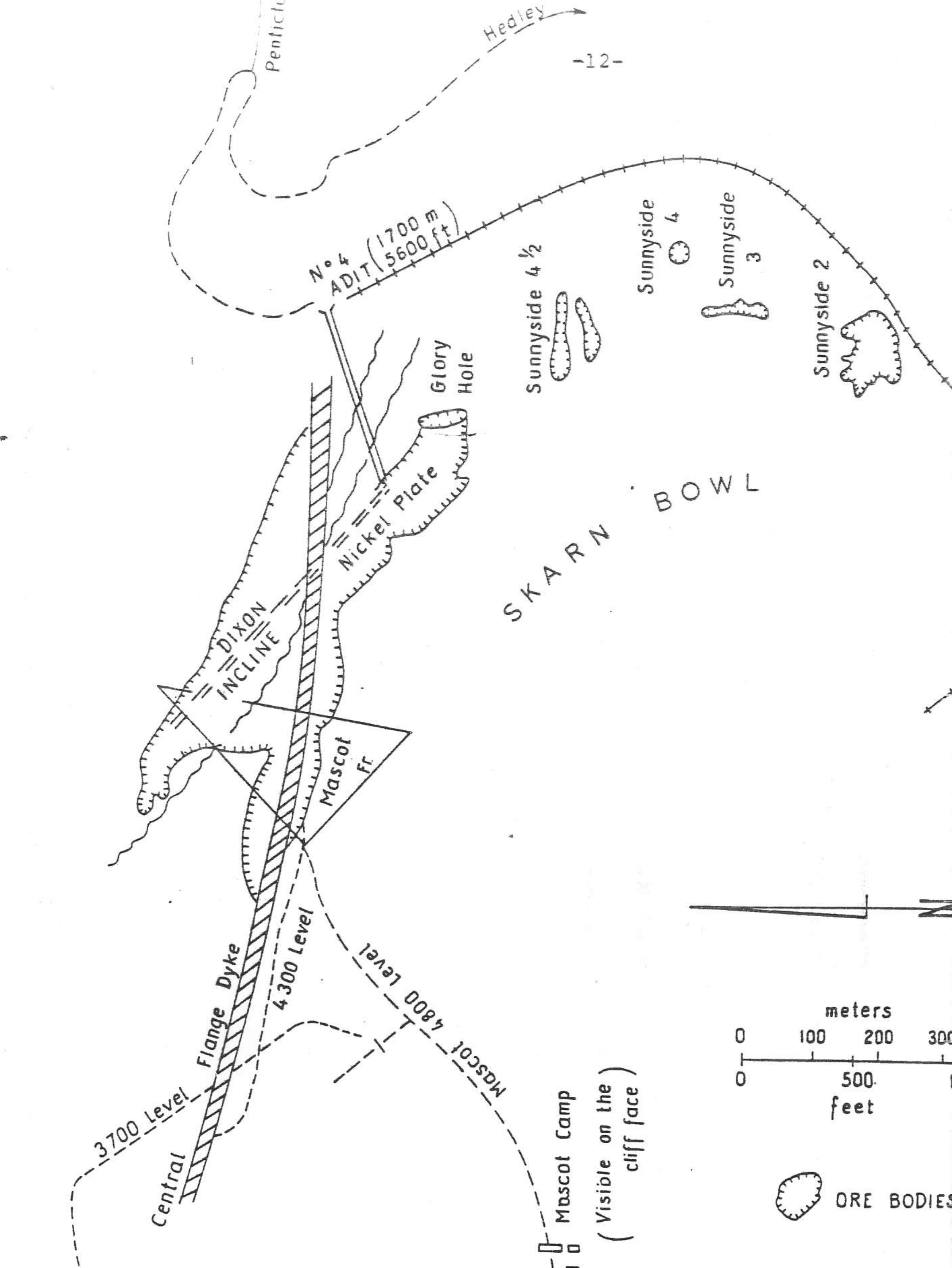
FIG. 1:1. GEOLOGY IN THE VICINITY OF HEDLEY

(AFTER BOSTOCK, 1940)

2,000 m thick. These rocks have been described in some detail by Rice (1947) and are considered to form the basal part of the Nicola group. They are all of Upper Triassic age. Figure 1:1 is an excerpt from Bostock's (1940b) map and shows the geology that can be seen from this viewpoint. The sedimentary rocks are intruded by two small bodies of early Jurassic diorite and gabbro (Hedley Intrusions, 189 m.y.) from which many sills and dykes emanate. The lower part of the section is intruded by a late Jurassic (162 m.y.) granodiorite.

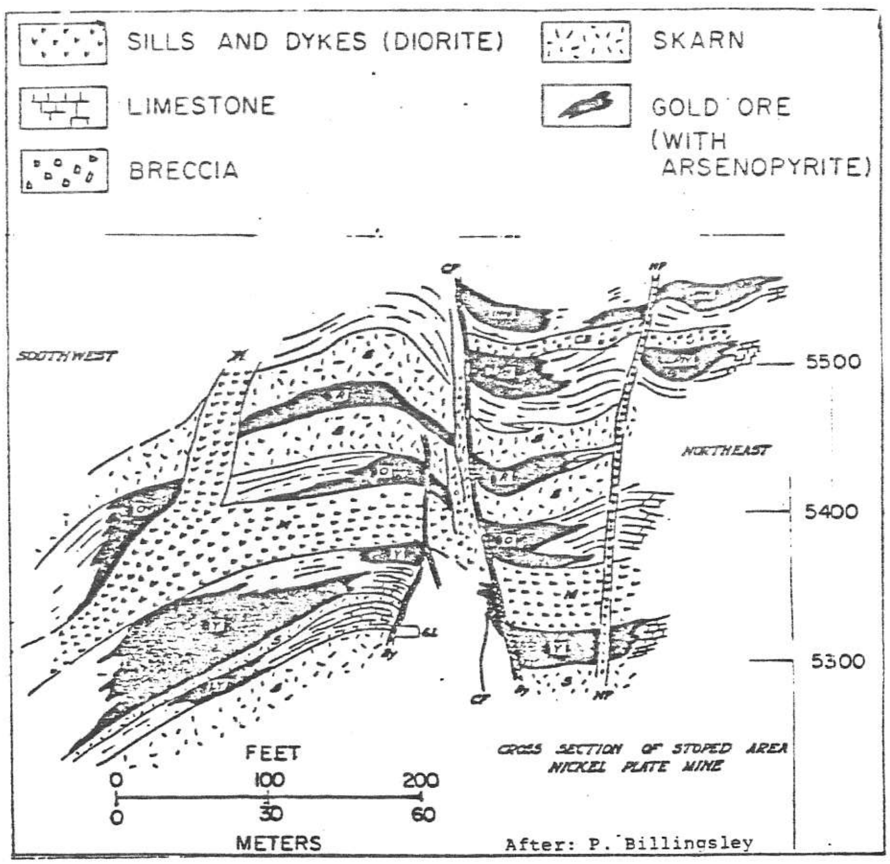
The beds dip moderately to the northwest and are truncated by a number of northeasterly trending faults, the largest of which is the Bradshaw Thrust. West of this fault, on Stemwinder Mountain, the sedimentary succession consists mostly of Hedley Formation and is thrown into an impressive series of folds. The Nickel Plate gold mine, of which the ruins of the concentrator can be seen from this point, produced 1.3 million ounces of gold between 1896 and 1930, when ore reserves appeared to be exhausted. A thorough geological study revived the mine and a further 1.7 million ounces were produced between 1934 and 1958, when operations finally closed. The results of this study are set forth in the paper by Billingsley and Hume (1941) which is without a doubt a classic demonstration of how geology can sometimes be of use, even to mining men! Ore shoots at the Nickel Plate occurred in garnet-pyroxene skarn produced by contact metamorphism of the Sunnyside and other limestones, and were generally less than 80 m from the outer edge of the Skarn zone (marble line). Their shape and size was controlled by crumples in the skarn and by intersection of sills and dykes which are offshoots from diorite and gabbro bodies of Hedley intrusions. Metallic minerals in the Nickel Plate skarn are: arsenopyrite, loellingite-safflorite, cobaltite, pyrrhotite, sphalerite, chalcopyrite, gold, pyrite and marcasite. Of these, arsenopyrite is the most abundant and important as most of the gold occurs as minute specks in it.

The Nickel Plate Mine and the Hedley Mascot Mine are under investigation and testing by G.M. Resources for the past two years. The upper underground workings have been re-opened and drilling has been carried out from both the surface and underground in efforts to establish some additional minable reserves. Several prospects lie outside the Nickel Plate skarn basin, some of which have had limited production of gold ores similar to Nickel Plate ores. These are usually related to small bodies of intrusive which have their own skarn envelopes. Good Hope Resources holds several of these: including the Canty property and the Good Hope. They have developed some limited reserves. The Good Hope ore is being



NICKEL PLA
HEDLEY B.C

from
P Billingsley



Notes Re: Nickel Plate Mine, Hedley, British Columbia.

The Central Flange (C.F.) and North Flange (N.F.) dykes occupy structures that previously may have served as conduits that provided the ore bodies stacked asymmetrically on their flanks. The North Flange obviously is younger in origin than the Central Flange (it cuts the yellow (y) ore) but both may have continued to produce ore almost simultaneously at the time the uppermost ore bodies, Lower Purple (L.P.) and Upper Purple (U.P.) were emplaced (exhaled?). Note also that the breccia (CB) is mapped not only as a stratum but also alongside or within the Central Flange structure. The author suggests that the ore bodies are exhalative.

R. H. Seraphim

mined on a share basis by Dankoe Mines, located south of Keremeos and ores will be trucked to the Dankoe Mill which will be visited on our return trip, where we can see some of the Good Hope ore. Several other companies have been active in the Nickel Plate Mountain area in the past two years.

Continuing, the highway follows the U-shaped valley of Similkameen River to Keremeos. The Similkameen Valley is the physiographic boundary between the rocks of the Cascade Mountains to the south, and the Interior Plateau to the north. Of note are the enormous talus slopes along the valley. This area was unglaciated during the last glacial episode and hence these talus piles accumulated for a long time.

Bedded cherts and massive altered basic lava and greenstone are well displayed. This lithological assemblage is typical of upper Paleozoic to mid-Triassic rocks in the Intermountain Belt.

A layer of white volcanic ash is visible in the soil on both sides of the road. It was erupted from Mount Mazama, Oregon, 6,600 years ago.

67 Keremeos. This fruit-growing region lies at the intersection of a north-south valley from the north with the Similkameen valley. The route follows the river southerly in this valley. The river joins the Okanagan River south of the International boundary.

90 Dankoe Mine. May be visited on return trip.
The road shortly leaves the Similameen valley to climb over the divide at Richter Pass, to enter the Okanagan Valley and descend towards the town of Osoyoos.

108 Spotted Lake salt deposits. Spotted Lake is a small ephemeral body of water with encrusted salt deposits formed as a result of ground water leaching and evaporating in a semi-arid climate. The salt is composed of about equal amounts magnesium sulphate and sodium sulphate with minor sodium carbonate and calcium sulphate. The peculiar ring structures are thought to be caused by surface stress resulting from alternate flooding and drying of the lake and crystallization of the salt.

113 Osoyoos. The road crosses Osoyoos Lake on a sand bar with a deep creek cut. Another sand spit, two kilometers to the south almost spans the lake. This provided a much wider, but shallower crossing for early travellers.

122 Osoyoos Look-out. STOP.
This look-out point near the top of the valley wall gives a vista of Osoyoos Lake, extending south to the town of Oroville in the U.S.A. The Dividend-Lakeview mine lies on the opposite slope near the U.S. border. A quartz vein in Paleozoic limestones and cherts was mined during the 1930's. Access was by adit entries from the hillside. A flotation mill operated at a rate of 75 tons per day for a few years. The continuation of this zone to the south across the border has several old mine workings where chalcopyrite-gold pods were mined during earlier days.

137 Anarchist summit. On the plateau at the top are scattered exposures of the Anarchist Group, which comprises upper Paleozoic greenstone, chert and argillite, with a low grade of regional metamorphism. These rocks are similar to the Kobau Group west of the Okanagan Valley.

156 Rock Creek. The Kettle Valley exposes a block-faulted Eocene sequence. This sequence consists of basal sandstone and conglomerate of the Kettle River Formation, in part derived from the underlying terrane, and in part composed of acid tuff. Above this is the Marron Formation, (Midway Formation of Daly, 1912), with a lower part of alkaline trachyte and phonolite flows, some containing feldspar rhombs, a middle part of andesite and trachyandesite and an upper part of acidic andesite. Many feeders to the various flows bear a marked similarity to the Tertiary plutonic rock to the east. Potassium argon ages of 49±2, 48±2 m.y. from these rocks indicate their Middle Eocene age (Matthews, 1963). The succession bears a remarkable resemblance to the lower two-thirds of the Tertiary sequence which may be seen in the White Lake Basin, 80 km to the northwest.

185 Boundary Falls Smelter site. In earlier days, an areal tramline transported ore for Lonestar Mine, just over the U.S. border to a small smelter at this location. This is the turn-off to Robert Mines which will be visited on the return trip.

196 Greenwood. This town was the site of a smelter which treated the ores from the Deadwood district. Remains of the smelter and the slag pile lie immediately south of the town.

LUNCH STOP at Travellers Cafe.

Continuing towards Grand Forks.

216 Phoenix Mine Road. The Oro Denoro Mine lies close to the highway. Exposures of limestone and breccias occur in

the vicinity of the turn-off.

222 Phoenix Mine. The mining plant operated by Granby was shut down in 1978. Equipment has been sold and buil have been stripped. Waste dumps and tailing ponds have reclaimed by contouring and planting to grasses. The c are now held by Noranda Mines and are under option to R River Resources Ltd., who have a regional geological and exploration program planned.

240 Grand Forks Lookout. This vantage point is a few hundred yards north of the International Boundary, and o a good view to the east along the Kettle River, and to north along the Granby River. The town of Grand F surrounded by fertile agricultural land, is situated a confluence of two streams. The slag piles and ruins o Grand Forks smelter, one mile north of the town, are all remain of a plant which early in the century processed of the direct-smelting copper ores from the mines of Boundary Camp.

The lookout is a short distance to the west of the G River Fault, which marks the western boundary of the Forks horst of metamorpohic rocks. In the western out these rocks are folded into a westerly-plunging ant clearly outlined by a sill of syenite that can be seen here.

249 Continue to Grand Forks for the night.

LEGEND

FOR TOUR ROUTE MAPS

INTRUSIVE ROCKS	AGE (M.Y.)
TERTIARY TO RECENT	60 – 0
LATE CRETACEOUS AND EARLY TERTIARY	80 – 60
EARLY TO MIDDLE CRETACEOUS	140 – 80
MIDDLE TO LATE JURASSIC	175 — 140
LATE TRIASSIC TO EARLY JURASSIC	215 — 175
PALEOZOIC TO MESOZOIC – ULTRABASICS	

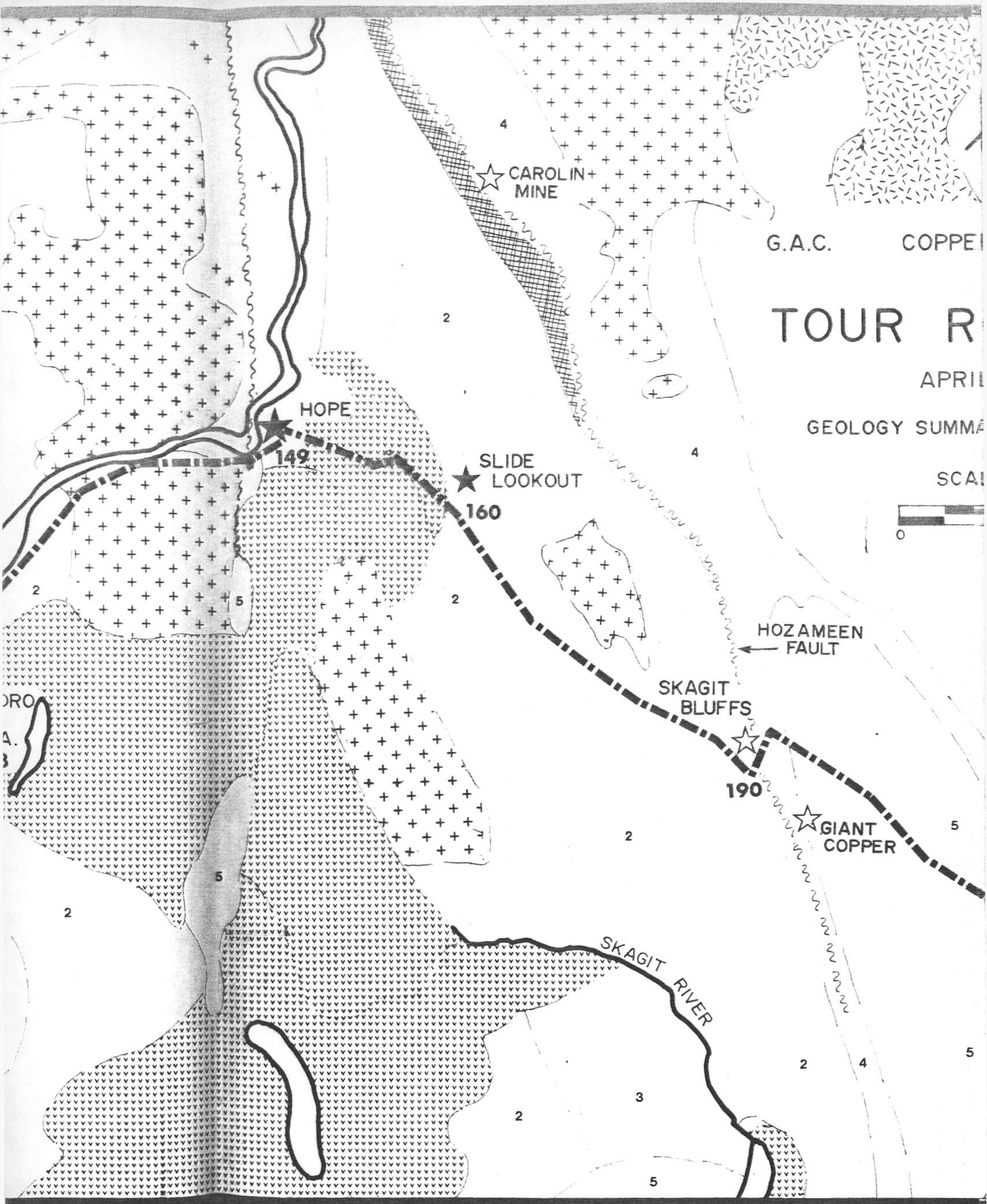
SEDIMENTARY & VOLCANIC ROCKS

5	CRETACEOUS AND TERTIARY – UNDIVIDED SEDS. AND VOLC.
4	JURASSIC — PASAYTEN, HARRISON LAKE ETC.
3	TRIASSIC — DEWDNEY CREEK, NICOLA, BROOKLYN ETC.
2	PALEOZOIC — CHILLIWACK, HOZAMEEN, KNOB HILL ETC.
1	SHUSWAP GNEISS COMPLEX

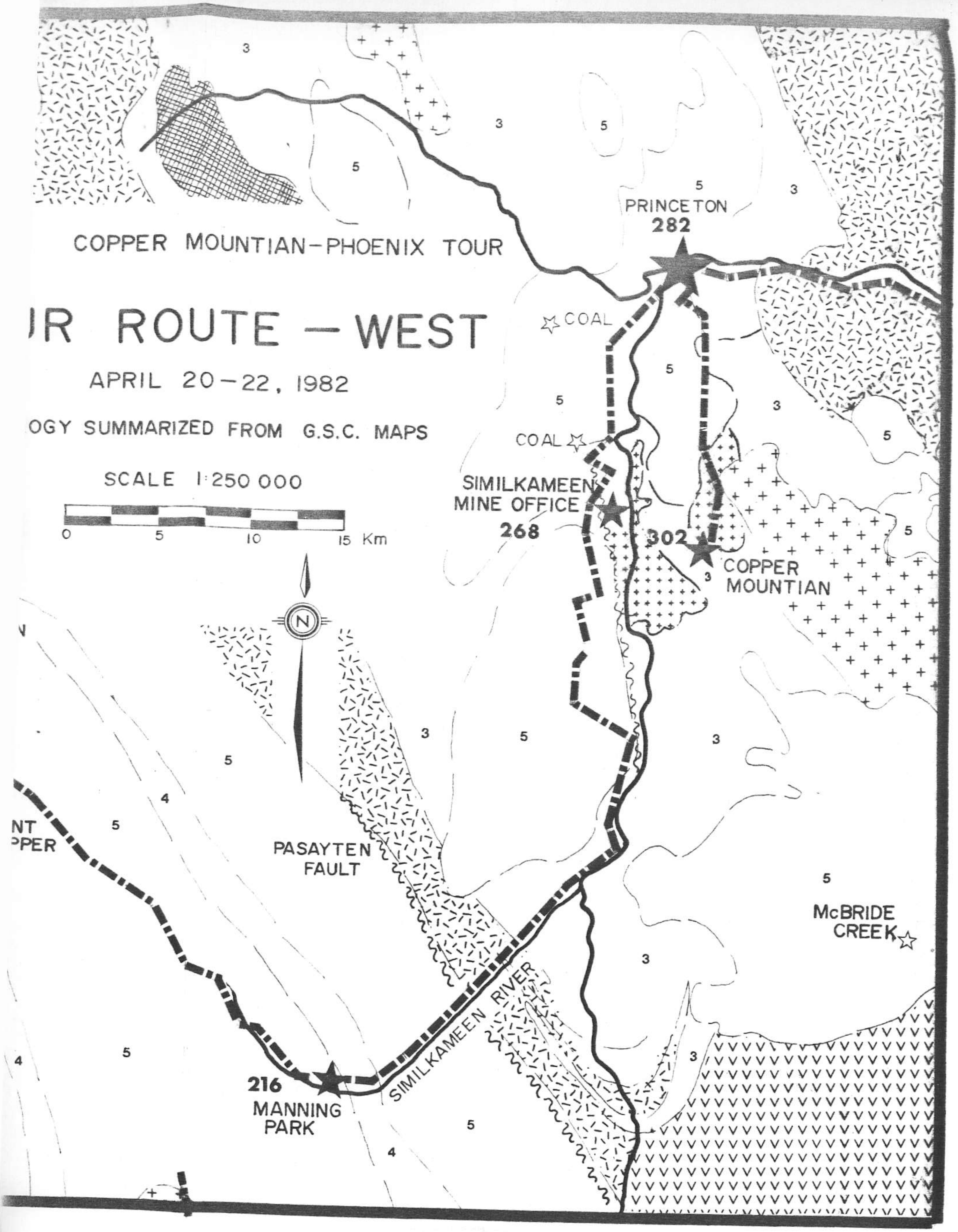
▬ ▬ ▬ TOUR ROUTE ★ MAJOR STOPS ☆ POINTS OF INTEREST

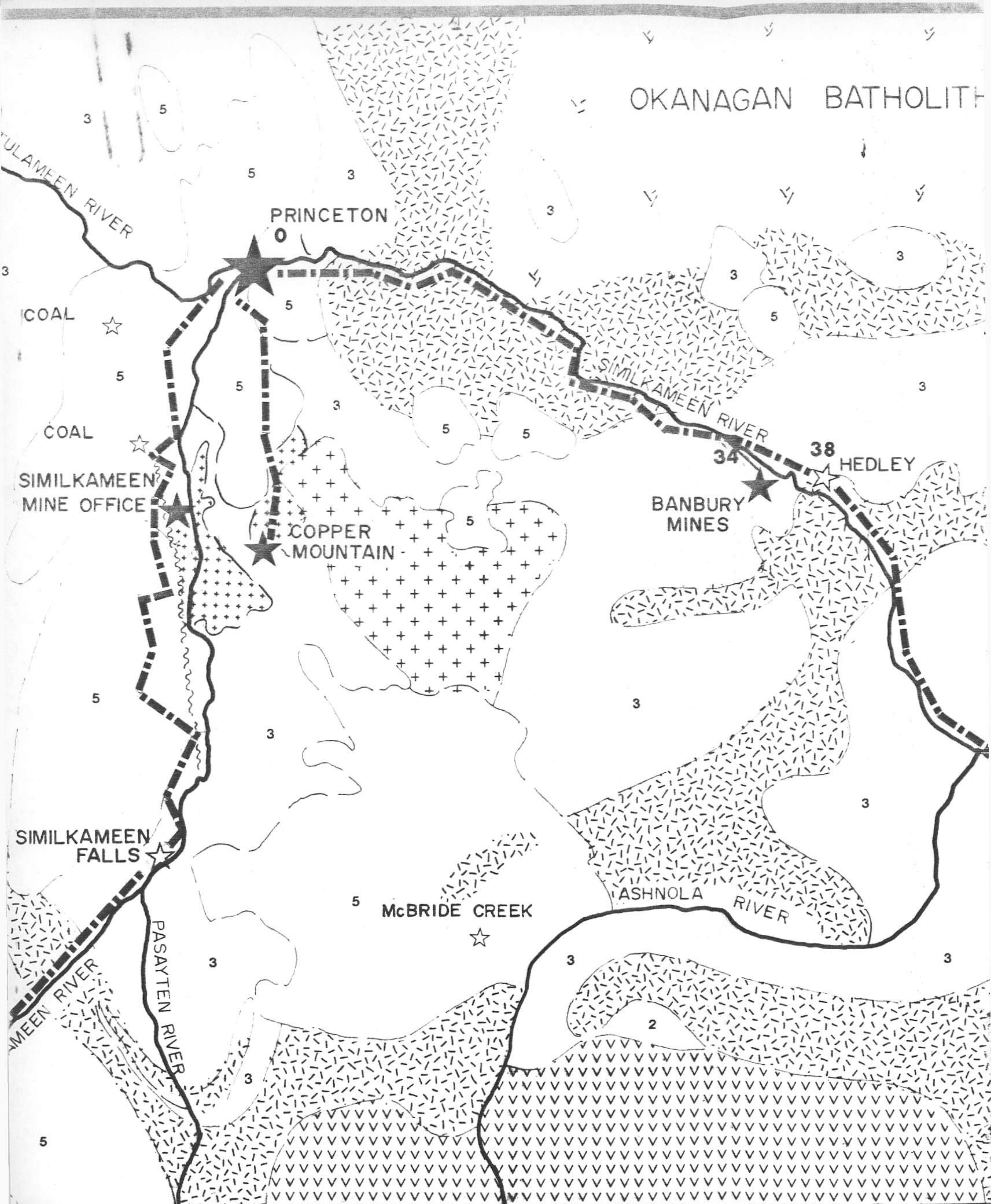
127 KILOMETERS


HARRISON LAKE
HYDRO STA.
123
SUMAS MT.
85
2
3
4
5



CAROLIN MINE
HOPE
149
SLIDE LOOKOUT
160
HOZAMEEN FAULT
SKAGIT BLUFFS
190
GIANT COPPER
SKAGIT RIVER
G.A.C. COPPE
TOUR R
APRIL
GEOLOGY SUMMA
SCA
0
2
3
4
5


COPPER MOUNTAIN-PHOENIX TOUR
ɔR ROUTE — WEST
APRIL 20—22, 1982
OGY SUMMARIZED FROM G.S.C. MAPS
SCALE 1:250 000
0 5 10 15 Km
N
PRINCETON
282
COAL
COAL
SIMILKAMEEN
MINE OFFICE
268
302
COPPER
MOUNTAIN
PASAYTEN
FAULT
McBRIDE
CREEK
SIMILKAMEEN RIVER
216
MANNING
PARK
NT
PPER
3
5
4


OKANAGAN BATHOLITH
TULAMEEN RIVER
PRINCETON
0
COAL
COAL
SIMILKAMEEN MINE OFFICE
COPPER MOUNTAIN
SIMILKAMEEN RIVER
34
38
HEDLEY
BANBURY MINES
SIMILKAMEEN FALLS
PASAYTEN RIVER
McBRIDE CREEK
ASHNOLA RIVER
SIMILKAMEEN RIVER
3
5
2