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Mathew S. Hedley

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Riveldrake

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THE UNIVERSITY OF BRITISH COLUMBIA

SUBJECT Summer Essay

THE WAVERLY MINE

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PROBLEM NO. DATE Nov. 15, 1928

NAME Mathew S. Hedley

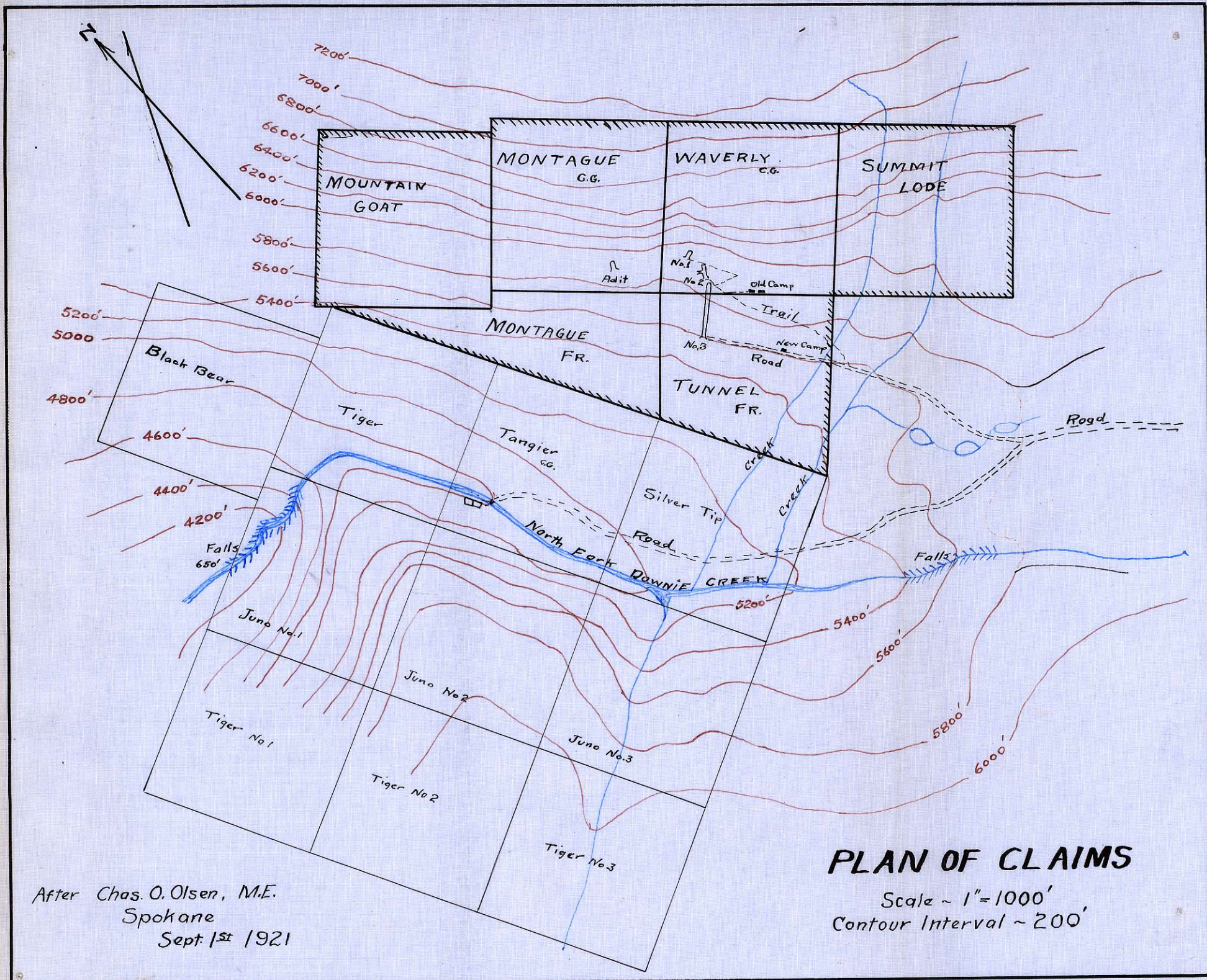
3rd Year Geol. Eng.



Ill. 1. Mt. Sorcerer. El. 10410'.
Waverly Pass in Foreground.



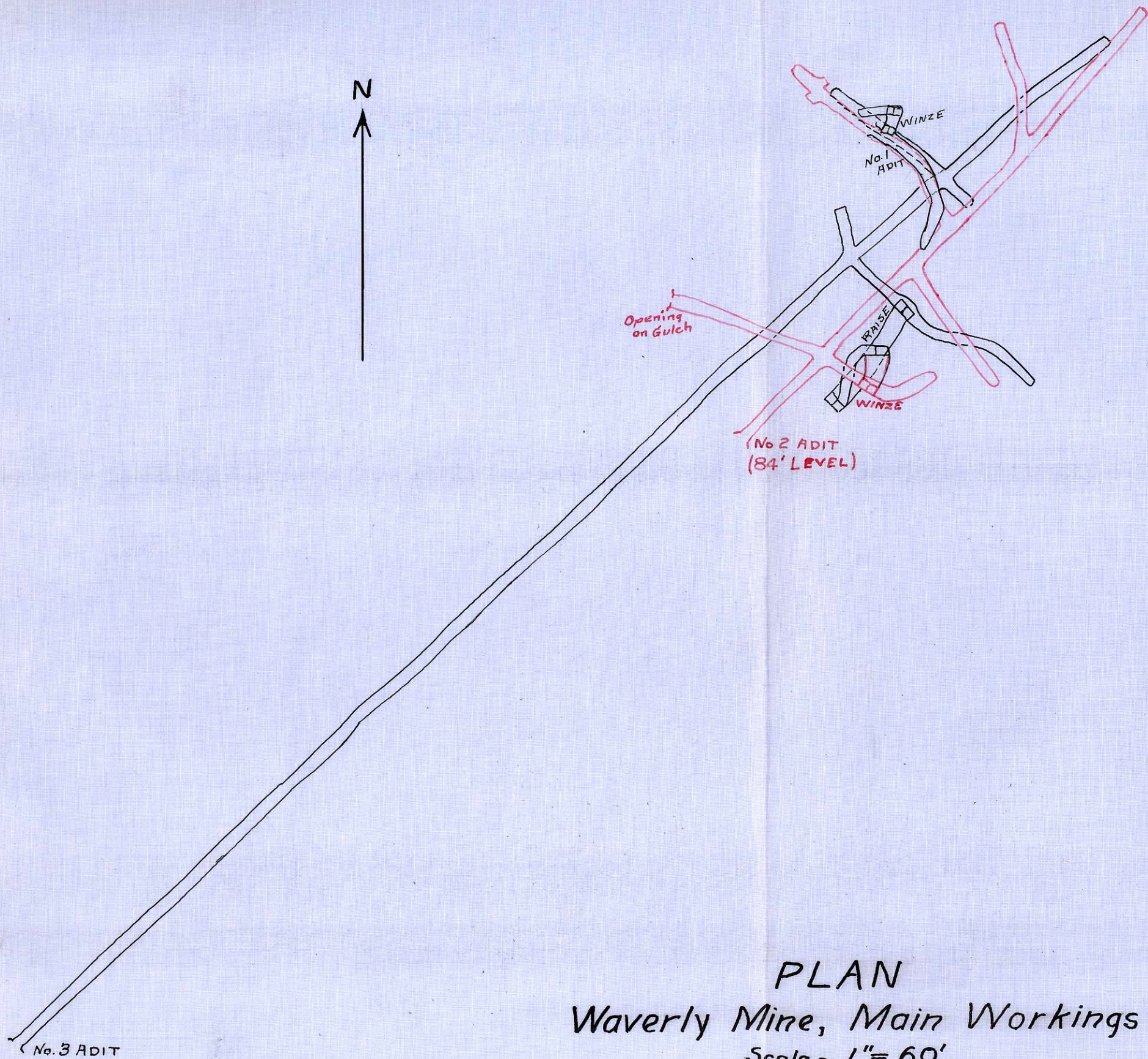
Ill. 2. Glacier-covered Mountains
near the Waverly--over 9000' in
elevation.



PLAN OF CLAIMS

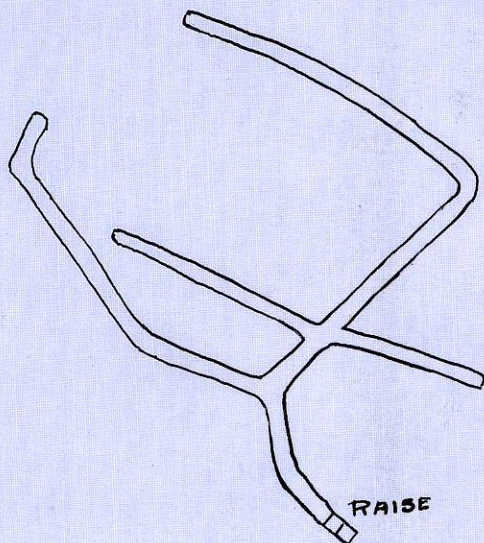
Scale ~ 1" = 1000'
 Contour Interval ~ 200'

After Chas. O. Olsen, M.E.
 Spokane
 Sept. 1st 1921

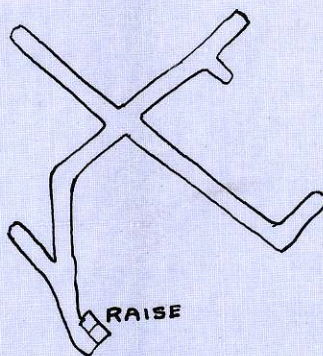


No. 3 ADIT

PLAN
Waverly Mine, Main Workings
Scale ~ 1" = 60'



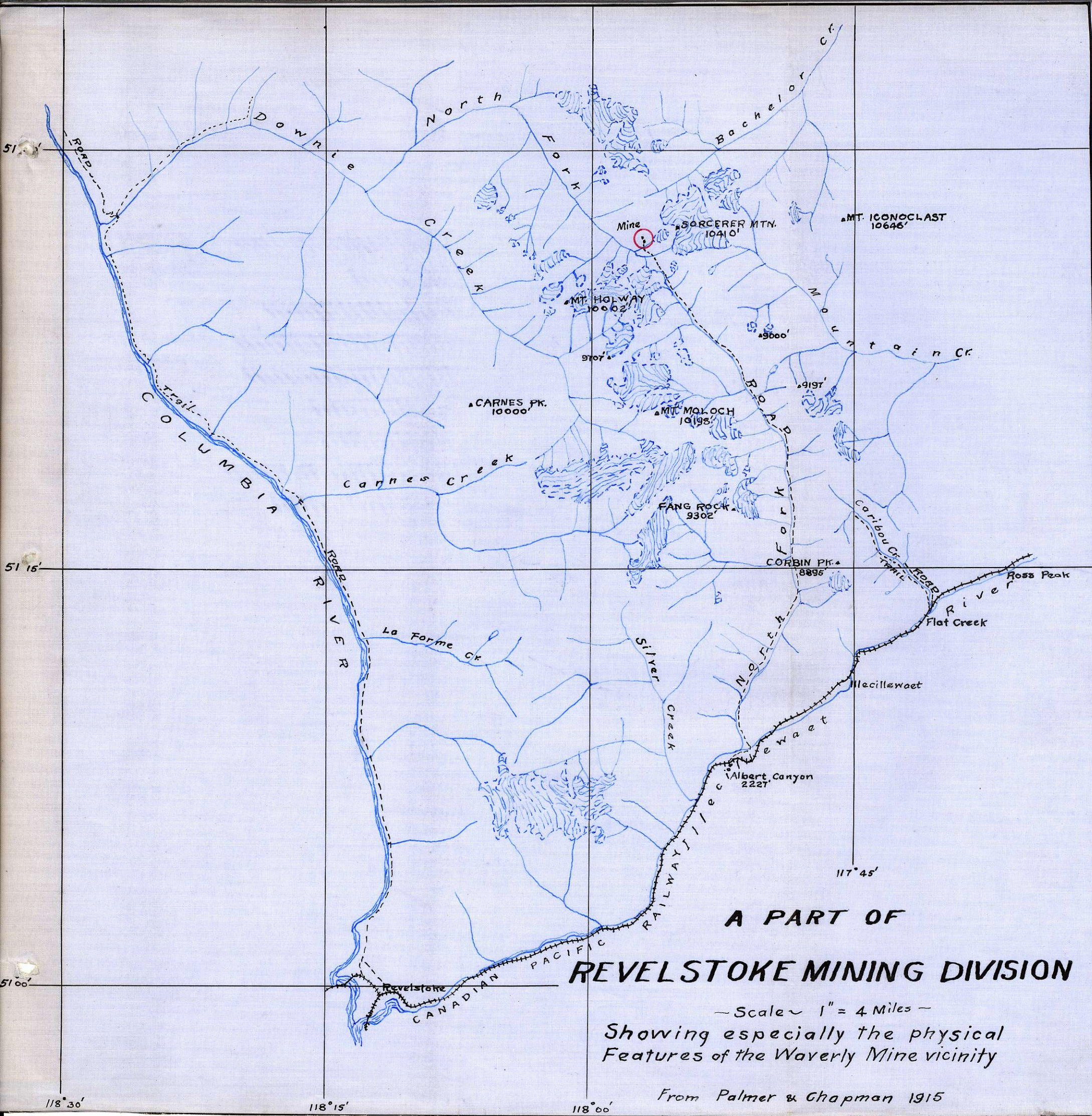
250' LEVEL



350' LEVEL

Waverly Mine

Scale ~ 1" = 60'



**A PART OF
REVELSTOKE MINING DIVISION**

— Scale ~ 1" = 4 Miles ~
Showing especially the physical
Features of the Waverly Mine vicinity

From Palmer & Chapman 1915

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Title

FOREWORD.

The Waverly mine has, as at the present date, long been associated with the Tangier mine, a great deal of the development work on both properties having been done concurrently by the same company or companies. As the two mines are in two distinctly different types of ore deposits, though not widely separated geographically, the writer will restrict himself to a description of the Waverly alone, the workings of the Tangier not being wholly accessible at the time of his visit.

LOCATION AND ACCESS.

The Waverly mine is located at the head of the North Fork of Downie Creek in the Revelstoke Mining Division. Access is by way of the Valley of the North Fork of the Illecillewaet River from Albert Canyon Station on the main line of the Canadian Pacific railway. The mine lies at an elevation of 5600' on the east wall of the valley, a mile and a half north of the divide between the two streams and 100' lower. It is $27\frac{1}{2}$ miles from Albert Canyon by wagon road. (See map of area, and sketch map.)

TOPOGRAPHY.

The country is extremely rugged, lying as it does in the Selkirk Mountains. The mine is on a steep bluffside having a slope of 35° on the average; snow slides are an ever present menace during the winter, and hence no timber may be cut close to the camp, though there are good stands of spruce

and balsam for mine use, at the north edge of the pass.

The property is fortunate, however, in being nearly level with one of the lowest major divides in the whole mountain area, the pass being practically speaking level for a mile and a half, and a quarter of a mile wide. The valley of the North Fork of the Illecillewaet, too, forms an excellent natural route for a road, there being no appreciable grades either way, save for a mile's climb onto the pass from the south. In common with all the other large valleys though, it is 5000' deep throughout its entire length, and numerous alder covered slides reaching a mile back from the river present a very real hindrance and danger to spring and winter travel.

Albert Canyon is at an elevation of 2227', and is rid of snow quite early in the year, but the slides along the road, having their origin among the peaks, linger till the end of June.

HISTORY.

The history of the mine dates back to 1895, the original Waverly and Montague claims, among others of the group, having been staked in that year by Ole Sandberg and James Kennedy, both of Albert Canyon. Ingress was then by way of Cariboo Creek and the summits above timber line, in a direct route from Flat Creek Siding. The following year a trail was built over the present route.

In the Spring of 1897 an English company, the Gold Fields of British Columbia Limited, was incorporated in London,

and acquired the Waverly--also the Tangier--for \$75,000, commencing active operations the same year. A road was built, a camp erected, and considerable work was done with a view to blocking out ore; in fact, almost all of the workings to be seen today had their origin under the old company. Enthusiasm ran so high that a railroad to connect with the Canadian Pacific was contemplated, and even a preliminary survey for it was run. A mill is said to have been brought in but never set up, as it was then found to be "not the right kind of mill".

This company finally abandoned the property in 1899, due officially to financial embarrassment in Africa and Australia. While they had control considerable valuable work was done, but money was lavished too freely and with too little judgment for the health of the property. When the crash came, the mine was found to be worth the barest fraction of the money spent on it. Three saloons were in full blast along the road as soon as it was completed, and so many are the tales of the old-timers of drunkenness, lax management and general extravagance, that they must be given some credence.

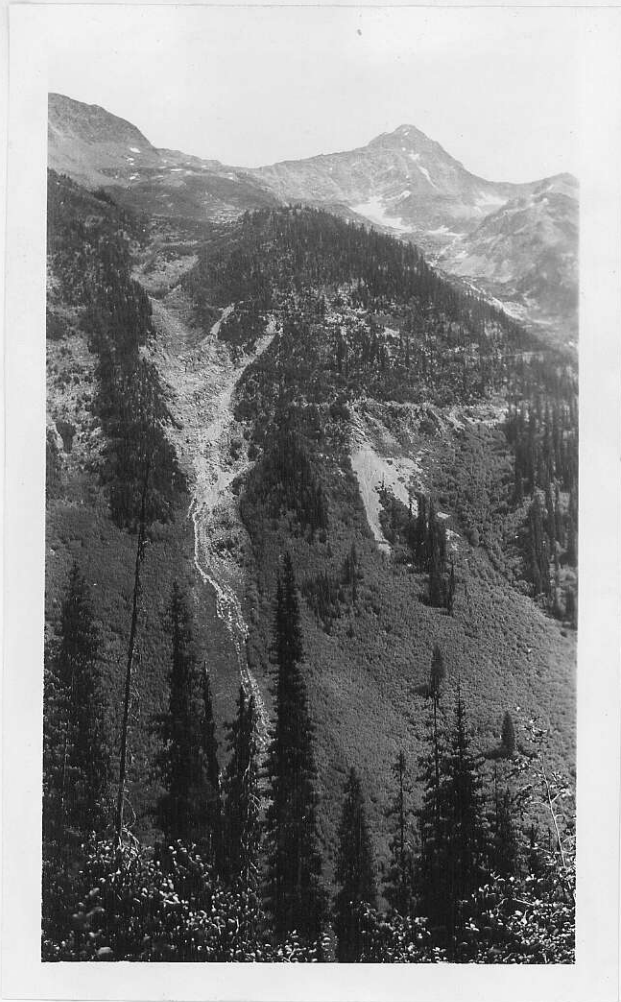
In 1900, Thomas Graham, a book-keeper for the company, returned to London, when he bought the Waverly-Tangier group for himself and Ole Sandberg, for a small consideration. It was apparently these two who crown-granted the Waverly and Montague claims in 1901. And they kept the other claims in good standing till 1918, though the original names seem to have been changed.

In 1908 Mr. W. Orville Young of Albert Canyon, now consulting engineer for the property, took an option on it for the Guggenheim Exploration Company of New York, but, owing to depression in the price of metals, this was allowed to lapse.

Negotiations were again opened in 1915, but did not materialize for two years, when the property including the Tangier, was bonded to G. H. Walters of Spokane through Mr. Young. The Waverly Mines Company of Spokane was formed the following year, of which Walters was secretary. And for the next seven years work was pursued after a rather desultory fashion.

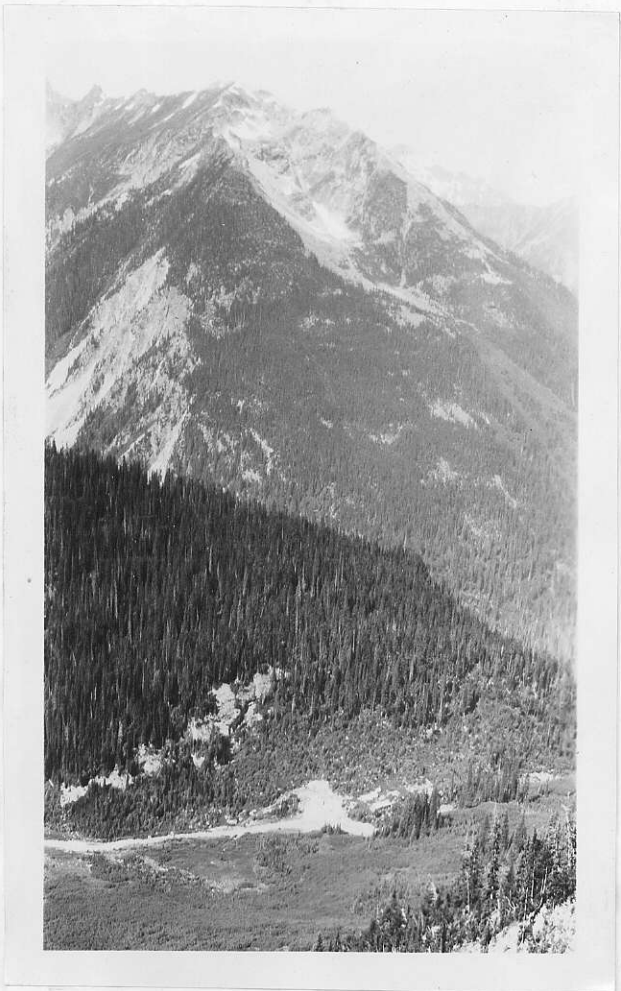
Work from 1918 to 1921 included some 200' of tunneling, evidently in No. 2 adit chiefly, for the old workings from No. 2 down were inaccessible in 1921^{*}. A millsite was planned near the Tangier mine 800' below, and three men were engaged for three months in trying to locate a trail down Downie Creek to avoid the haul back over the summit, in spite of the fact that any possible road would be several miles longer than the existing one, and would then strike the Columbia 46 miles from rail. In 1922 a road was commenced from Flat Creek siding by way of the pass at the head of Cariboo Creek, in order to cut nine miles off the existing route at the expense of several miles of 9% grade on the outhaul; only some three miles were built, however, before the project was abandoned. The next

* Minister of Mines Annual Report, 1921.



Ill. 3.

Waverly Mine. Taken
from 200' above the
Tangier.



Ill. 4.

The Tangier Mine,
from No. 2 Adit
of the Waverly.

three years saw a small crew of men during the summer months reconditioning the old workings, and doing inconsiderable drifting. An attempt was made in 1923 to work during the winter, but a snow slide took out the old camp--which had stood for 25 years--and the following year a second slide demolished one of the two cabins subsequently erected.

Since 1925 work has consisted in keeping the claims in good standing, and last year the combined property was bought by the Waverly -Tangier Mining Company of Vancouver, E. J. Cameron and W. H. Hughes, purchasers. This company intends to commence milling operations in the near future, and will work during the winters; hauling by sled being deemed feasible.

WORKINGS.

During the summer of 1928 the writer had the good fortune to be engaged as field assistant to Dr. H. C. Gunning of the Geological Survey; two weeks were spent in covering economic and general geology in and about the mine. During this time an underground survey with external control was made of the main workings with the use of a Brunton compass.

The property consists of a group of six claims, now known as the Mountain Goat, the Montague, the Waverly, and the Summit Lode mineral claims, and the Montague and Tunnel fractions. (See sketch map). The present camp consists of one frame shack on a 20' ledge that has been blasted out of the limestone bluffs for 700' to the portal of the lowest adit, through which all ore in future will be mined.

The external workings consist of four adits, the most northerly of which was not visited, though it was known to consist of a 20' crosscut with a 17' winze at the face, in vein matter. The other three adits are, roughly speaking, one above the other, the lower or No. 3 adit lying at an elevation of 5600' approximately, and No. 1 461' higher. (See ill. 3).

No. 1 is in some 90' to the S.E. with a winze 45' deep near the portal on a dip-slope of 52°, from the 28' level of which a 20' drift parallels the adit back towards the surface. A few small open cuts are scattered to the south of this adit.

No. 2 lies about 200' southerly from No. 1, and 84' lower, being known also as the 84' level. It is a crosscut to the N.E. 300' long. Drifts are run 80' westerly and 60' easterly from a point 60' from the portal; also an easterly drift 75' long at 122', and two westerly, 113' and 65' long at 150' and 205' in respectively. Besides these ^{there} are three short drifts in which ore is stored, and which are hence inaccessible. The first westerly drift was driven to daylight in a gulch. In the first easterly drift a winze was sunk 25' from the adit; this is very steep, and 108' deep, a short level being run northerly at 81' depth, known as the 150' level. A little stoping has been done from the adit to near the winze.

No. 3 is 376' below No. 2 and like it, is a crosscut 760' in length. A drift runs 115' easterly, 585' from the portal, and one westerly at 650' for 70'; minor drifts a few feet in length were started opposite these. Thirty-eight feet

along the easterly drift a raise was put up to the same level as the bottom of the winze from No. 2, with which it is connected by a 35' drift.

A 250' level was run from the raise. This commences as a westerly drift for 25', then swings into a crosscut 120' long, ^{Three drifts, 70' to 120' long} ~~lying~~ to the west, and one 50' in length, to the east of the crosscut.

Below this lies the 350' level, consisting of a westerly drift 45' long, giving off half way to the face to a crosscut 100' long, with easterly and westerly drifts midway.

GENERAL GEOLOGY.

The mine lies near the bottom of a band of blue-gray crystalline limestone some 1500' thick. The limestone has a few carbonaceous phases, and contains small scattered pyrite cubes throughout; the whole is fractured, and is cut by a maze of fine veinlets both of calcite and less commonly of an intimate mixture of calcite and quartz. It lies conformably below a great thickness of quartzites and schistose argillaceous sediments; and conformably above carbonaceous and sometimes calcareous, pyrite-bearing argillaceous schists and phyllites about 1200' in thickness. Below this again is some 300' of folded limestone, in which is situated the Tangier. (See ill.4.)

These sediments all strike N.55° W, dipping easterly at 60-80°. In age they are pre-Cambrian, and appear to lie in or near the top of the Laurie formation of Beltian age, though

* R. A. Daly C.G.S. Memoir 38.

extreme folding and rugged topography along the strike to the south makes the linking up with the section on the Canadian Pacific railway very difficult.

Ill. 1 shows the bluffs of the Waverly limestone on the flank of Mt. Sorcerer, the mine being just off the lower left hand margin; taken facing N.E. across the pass.

Glaciation has been extensive. At one time the main flow of ice was evidently south, but subsequently valley glaciers flowing north, gouged out the head of the North Fork of Downie Creek into a basin 900' deep, and again, below the Tangier a lateral glacier has left this basin hanging some 650' above the main valley. Present day glaciers are receding rapidly, but are still plentiful on the northern and eastern slopes. (See map of area, and contrast ill. 1 and 2 which were taken facing easterly and westerly across Waverly Pass).

ECONOMIC GEOLOGY.

The orebodies of the Waverly are chimney-shaped replacement zones in the limestone that in general follow bedding slips. The mineralizing solutions came up fault fissures, replacing the limestone in irregular bodies up to 80' in width.

The minerals were originally largely sulphides, presumably galena, pyrite, some sphalerite, and argentiferous gray copper, in a gangue of quartz and calcite. Then the whole was subjected to intense crushing, and the minerals were altered by descending solutions largely to carbonates and oxides, cerussite, anglesite, copper carbonate and iron oxide being distinguished in the ore today. No sulphides, other than

disseminated pyrite in the country rock, are to be seen save a few residual particles in No. 1, and some kidneys of galena in the open cuts.

There are two orebodies, spoken of as the upper and lower veins. There is also a 5' quartz vein outcropping just below the portal of No. 1 adit, which is said to carry very high gold values at the surface, but which could not be placed with certainty underground.

The upper vein is seen best in No. 1 adit, where it strikes 20° west of north, dipping at about 50° to the east. It is a mineralized zone 10' wide in the winze, with well defined walls. Mineralization is chiefly on each wall for two to three feet, showing a few remnants of gray copper and galena in oxides, in a gangue of calcite and a little quartz.

In the 84' level there are really three orebodies, but the first two are spoken of together as the "lower vein", since the walls are indistinct save the foot wall of the first, and there is a certain amount of mineralization between them. The ore in the drifts on the foot wall is 10-15' wide, and fades out near the winze. The second easterly drift is on the hanging wall of the lower vein, and is, strictly speaking, following a crushed quartz calcite vein about 5' wide. Another small calcite vein is encountered at 205' in the main crosscut, with an ill-defined hanging wall; this was followed westerly for 65', and is apparently the upper vein.

The winze was sunk at the edge of the mineralized zone. The 150' level is in badly crushed ground, a zone 20' wide

being mineralized mainly by limonite in a gangue of crushed calcite with a little quartz. The raise follows a clean, polished fault wall, not in ore.

The 250' level shows a good foot wall 45' from the raise, striking a little north of west, and dipping at 70° to the north. This zone of iron oxide and copper stain in crushed calcite and some quartz is 26' wide, in the crosscut, but fades out, apparently, within 50' on either side. The crosscut continues in barren limestone with calcite stringers, then a drift follows below a smooth fault wall: from 15' to 30' being in heavy iron oxide.

The 350' level, after crosscutting from the raise at a small angle, encounters a rather barren calcite vein, and then turns across the formation through an ill-defined and poorly mineralized zone nearly 80' in width. Drifts in this zone follow a smooth fault wall, and show iron, copper and lead stain throughout. The crosscut ends in a vertical slip.

In No. 3 adit, the main easterly drift follows an irregular tight fault wall in barren ground. Sixty feet farther on in the crosscut the westerly drift follows a slight fault wall, while opposite this intersection a very little iron oxide is seen in crushed limestone and calcite. The crosscut continues in barren ground to the face.

VALUES.

Little or no idea can be gained of the values present from a mere inspection of the ore; detailed sampling would have to be done before one could ascertain the approximate working

limits of the ore bodies. Through the courtesy of Mr. W. Orville Young, access was had to an assay chart made during the last active operations, but the writer feels that it would be presumptuous on his part to make any detailed statement on the strength of such grounds.

In general though, the ore is seen to vary considerably in value, varying also in the relative proportions of the valuable metals present. Values are in silver, lead and gold, while copper appears to be of practically negligible importance.

The assays show silver values of from 4 to 90 ounces per ton, lead from 4% to 80%, and gold up to an eighth of an ounce: the best returns being got from the winze in No. 1. While the assay chart is not any too specific, it would indicate that the greater part of the mineralized areas will make mill feed.

DEVELOPMENT--(External Factors)

The mine is admittedly a milling proposition, and as such, its precise location forms a considerable obstacle to development.

Water sufficient for camp use is obtainable for most of the year from a stream 200' distant; and the year's supply from another stream 600' farther south. Natural power is not so easily available, there being two logical locations for a hydro-electric plant: one at the falls just below the Tangier, where a large but very muddy volume of water persists the year round, and the other just south of the pass, $2\frac{1}{2}$ miles from the mine, the water there being almost clear. A millsite with an

adequate supply of water would have to be near either of the above locations, or else at the upper falls marked on the sketch map--probably the better site of the three. The chief expense factors are thus seen to be the transportation of ore from mine to mill, and a considerable up-grade on the way out with concentrates.