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REPORTS

ON

SNOWFLAKE AND WAVERLEY-TANGIER  
MINERAL PROPERTIES  

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REVELSTOKE MINING DIVISION

COMPILED BY

JOHN D. GALLOWAY, Provincial Mineralogist



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*To the Honourable W. A. McKenzie,  
Minister of Mines, Victoria, B.C.*

SIR,—In accordance with your instructions of November 1st, I have the honour to submit herewith Reports on the Snowflake and Waverley-Tangier mineral properties. Owing to the demand for information on these properties it has been considered advisable to issue this special bulletin, giving full information to the public.

I have the honour to be,

Sir,

Your obedient servant,

JOHN D. GALLOWAY,

*Provincial Mineralogist.*

# REPORTS ON SNOWFLAKE GROUP.

## REVELSTOKE MINING DIVISION.

In order to give all available information to the public regarding the *Snowflake* group, owned by the Snowflake Mining Company, Limited (N.P.L.); the following reports are published:—

- (1.) Report by B. T. O'Grady, Assistant Resident Engineer, No. 5 Mineral Survey District; reprint from 1922 Annual Report of the Minister of Mines.
- (2.) Report by A. G. Langley, Resident Engineer, No. 5 Mineral Survey District; reprint from 1927 Annual Report of the Minister of Mines.
- (3.) Interim report by A. G. Langley, dated June 22nd, 1928.
- (4.) Report by F. W. Guernsey, made in August, 1928, for the Snowflake Mining Company, Limited (N.P.L.).
- (5.) Report by John D. Galloway, Provincial Mineralogist; examination made October, 1928.
- (6.) Report by F. W. Guernsey; examination made October, 1928.

### REPORT BY B. T. O'GRADY, ASSISTANT RESIDENT ENGINEER.

(REPRINT FROM ANNUAL REPORT, 1922.)

#### SNOWFLAKE GROUP, REVELSTOKE MINING DIVISION.

This property, consisting of nine claims owned by Ole Sandberg and Gus. Hedstrom, of Revelstoke, is situated on the East fork of Silver creek and is reached by a trail 7 miles in length which starts from the Canadian Pacific Railway tracks 2 miles west of Albert Canyon. The claims staked are on the north-westerly continuation of the *Woolsey* vein, geological conditions and ore occurrence being almost identical on both properties. The *Woolsey* group was described in the Annual Reports for 1918 and 1919. The elevation of the *Snowflake* camp is 5,500 feet above sea-level, or 3,300 feet above Albert Canyon. New cabins were being built at a convenient distance from the workings when the property was visited in September.

The vein, 12 to 17 feet wide where examined, is a quartz-filled fissure conforming to the stratification of the enclosing carbonaceous slates and is remarkable for its persistence and continuity, being easily traceable for thousands of feet north-westerly up the mountain from the *Woolsey* workings. The vein dips at 40° to 50° to the north-east. The elevations along the outcrop range from about 5,800 feet at the south-easterly end of the claims to about 7,000 feet on the summit. One claim has been staked beyond the summit.

The principal ore-mineral is argentiferous galena occurring in streaks, bunches, and disseminations in the quartz, the associated minerals being zinc-blende and pyrite, which do not appear to be intimately mixed with the galena. The ore, therefore, is chiefly of the concentrating variety, though some high grade could be mined for shipment.

The workings examined, consisting of open-cuts scattered along the outcrop for several hundred feet, are at the south-easterly end of the claims on the ground adjoining the *Woolsey* group. At 6,000 feet elevation an open-cut shows a width of 1 foot of nearly solid galena on the foot-wall. A short distance to the south-east and a little below it an open-cut shows the vein 12 feet wide, with from 1 to 1½ feet of nearly solid galena on the foot-wall, with several feet of milling-ore on the hanging-wall.

Continuing south-easterly a short distance and a little lower down the hill, an open-cut shows the vein 17 feet wide, with 4½ to 5 feet of milling-ore (containing a streak of solid galena) on the foot-wall and 3 to 4½ feet of milling-ore on the hanging-wall. The showings in this open-cut appear to be part of an ore-shoot of appreciable length, possibly several hundred feet long.

Ore sorted for shipment will assay from 50 to 80 oz. in silver, 40 to 60 per cent. lead, and 4 to 6 per cent. zinc. The values to be expected from the milling-ore are indicated by a milled sample of 30 lb. taken across a width of 9½ feet on the adjoining *Woolsey* property, which assayed: Silver, 6.6 oz.; lead, 6 per cent.; zinc, 4 per cent.

From the cursory examination made it would appear that further work is required to determine the character and continuity of the deposit; the future of the prospect depending on the development of a large tonnage, having in view the ultimate erection of a concentrator. It would be premature to elaborate on future operations, but it may be said that the property has many natural advantages, as it can be developed at depth by tunnelling; there is a plentiful supply of mining-timber available, while the economical development of water-power on Silver creek should present no difficulty.

## REPORT BY A. G. LANGLEY, RESIDENT ENGINEER.

(REPRINT FROM ANNUAL REPORT, 1927.)

## SNOWFLAKE GROUP, REVELSTOKE MINING DIVISION.

This property, comprising a group of nine claims, was acquired during the year from the original owners, Gus Hedstrom and Ole Sandberg, by the Snowflake Mining Company, Limited, of Vancouver. The capitalization is \$1,250,000, divided into 2,500,000 shares of 50 cents par value. J. B. Williams, of Vancouver, is president, and D. H. Lougheed is mine superintendent. The property is situated on Clabon creek, adjoining the *Woolsey* to the west and south. The mine camp, which is situated on a timbered hillside within a short distance of the workings, has accommodation for a crew of about sixteen men. The elevation of the camp is 5,400 feet (aneroid), or 3,300 feet above the railway, and is reached by a trail approximately 9 miles long.

In the vicinity of the workings the formation is composed of a dark slate, striking N. 50° W. and dipping at about 45° to the north-east. In the bluffs above the camp a strong quartz vein 15 to 20 feet wide is freely exposed for a considerable distance and conforms to the dip and strike of the formation. This in all probability represents the westerly continuation of the No. 5 vein of the *Woolsey*.

At an elevation of 5,900 feet the No. 1 tunnel had been driven into the hillside for 85 feet in a north-westerly direction, following a streak of clean galena in the slate on the foot-wall side of the main vein. The face of this tunnel was in mineralized ground which offered good possibilities for further prospecting, but work had been suspended as the ore showed a tendency to strengthen in the bottom; and as the latter end of the tunnel had been run at an adverse grade, it was decided to leave the exploration of this ground to be accomplished from the No. 2 tunnel.

From the No. 1 level 735 sacks of high-grade silver-lead ore had been extracted during the course of development and sacked for shipment. A sample taken of the sorted ore from some of the sacks assayed: Gold, 0.02 oz. to the ton; silver, 58.8 oz. to the ton; lead, 58.6 per cent.; zinc, 3.4 per cent. Another sample taken across a width of 6 inches of clean ore in the tunnel ran: Gold, 0.02 oz. to the ton; silver, 40.9 oz. to the ton; lead, 76.1 per cent.; zinc, 0.5 per cent.

The No. 2 level, which was being driven at an additional depth of about 50 feet, had been advanced for 126 feet in a direction of N. 22° E. with the objective of crosscutting the ore exposed in the No. 1 and the main quartz vein. It was estimated that this tunnel only had a few feet to go to reach its objective.

Following the outcrop of the main vein around the bluffs in a south-easterly direction, the No. 3 tunnel is reached in a horizontal distance of about 300 feet from the No. 2. Here there is evidence of cross-fracturing in the main vein and a short length of drift at a few feet below the surface in the foot-wall side had exposed a nice showing of clean galena and zinc ore along a length of about 15 feet, with ore in either face. The ore had a tendency to strengthen in the bottom of the drift and in one place showed a width of 30 inches of clean galena. It was the intention of the management to thoroughly prospect this promising showing by drifting and sinking.

Between this tunnel and the No. 1 the vein is strong and well defined. It is composed of massive quartz and carries a persistent streak of galena on the foot-wall side, and where fracturing has occurred it is mineralized with disseminations and occasional small pockets of galena, indicating that the galena is secondary to the quartz.

As yet not enough work had been done, in the writer's opinion, to allow an estimate being made of any important tonnage of milling-grade ore. During the year the results of shallow prospecting-work have been encouraging and demonstrated the presence of high-grade ore, fully justifying further development at depth. It is understood that during the winter months the company intends to drive a low tunnel which will gain a depth of approximately 600 feet on the vein.

Besides the main vein, there are others on the property which were not examined, but are said to offer good possibilities. The mine is well situated for economic production, and should ore be developed in sufficient quantity to warrant the equipment of the property for more extensive operations, the cost of transporting ore and supplies to and from the railway could be greatly lessened by improvements to the present trail and to the present facilities for handling the ore. Water is also available for power and milling purposes, while there is plenty of timber for mining requirements. At the railway a siding was constructed during the year to facilitate the shipment of ore, of which 34 tons was shipped to Trail during the fall.

## REPORT BY A. G. LANGLEY, RESIDENT ENGINEER.

(INTERIM REPORT, DATED JUNE 22ND, 1928.)

## SNOWFLAKE GROUP, REVELSTOKE MINING DIVISION.

This property, which was acquired in 1927 by the Snowflake Mining Company, Limited (N.P.L.), consists of a group of nine claims.\*

## LOCATION.

The mine-workings are situated on the steep slope of a high mountain on the northerly side of the East fork of Woolsey (Clabon) creek at a distance of approximately 8 miles by trail from the Illecillewaet river, which is crossed by a small bridge 2 miles west of Albert Canyon Station of the Canadian Pacific Railway.

The elevation of the mine camp and lower tunnel is 5,400 feet, or 3,300 feet (by aneroid) above the main line of the Canadian Pacific Railway. A good trail, over which wheeled go-devils are used, follows Woolsey creek until the East fork is reached and then a steep switchback trail leads to the mine camp.

## GEOLOGY.

The steep hillside in which the workings occur is composed of dark slates and bands of carbonaceous limestone, striking north-westerly and dipping at about 45° to the north-east. In this formation a series of massive quartz veins has been injected between the bedding-planes and probably owe their origin to a near-by granite-mass. Small quartz stringers and inclusions also seem to be a characteristic feature of the sediments in this area.

Along the strike of a massive quartz vein which occurs on the *Snowflake* and can be traced into the adjoining property of the *Woolsey* group numerous exposures of mineralization can be seen. The exposures are mostly on the foot-wall side of the vein, although there is also evidence in places of mineralization in the hanging-wall side. In the writer's opinion, the quartz vein, which is pre-mineral, provides a channel along its contact with the slates for the mineral solutions, with the result that the ore-deposition occurs principally in the slates adjoining the foot-wall side of the quartz, and where the quartz has been fractured disseminations and pockets of galena occur. In places vugs containing quartz crystals have been filled with galena.

## WORKINGS.

Work was first started at the No. 1 tunnel, elevation 5,900 feet. Here a drift run in slates on the foot-wall side of the main quartz vein encountered a joint-plane fracture having the same strike as the vein, but dipping at about right angles to it. This fracture was filled with galena along a length of about 85 feet. Its width, pinching and swelling with the rolls of the wall, varied from several inches to over a foot, with an average of about 6 inches. From this tunnel 735 sacks of sorted and cobbled ore were shipped to Trail.

There is no appreciable tonnage left between this level and the surface, while the downward continuation of the ore-streak has not been explored. In this case the ore solutions apparently followed up the foot-wall contact of the quartz vein and filled an open joint-plane fracture in the slates.

The No. 2 level, which has been driven at an additional depth of approximately 65 feet to explore the downward continuation of the ore occurrence in the No. 1 level, intersects the quartz vein at 147 feet, which at this point has a width of about 12 feet.

From the point of intersection 137 feet of drifting has been done along the foot-wall side of the quartz vein, which latter has been crosscut at three places. Towards the westerly end of the drift the quartz as exposed in the tunnel carries iron pyrites over a narrow width, and at 27 feet from the crosscut there is a narrow exposure of quartz with disseminated galena along a short length. No ore-body of any commercial importance had been developed on this level. This level does not explore the possible downward continuation of the "joint-fracture ore."

The No. 3 level has been driven at an elevation of 5,780 feet approximately, at a distance of about 300 feet to the east of No. 1 tunnel. This was driven to explore an outcrop of galena

\* NOTE.—Three additional claims added later.

which had been deposited where cross-fracturing or sharp folding had taken place. The galena was plainly visible in the face of the bluff and probably constituted the best showing on the property.

A short crosscut encountered a lens of ore lying in slates and showing a maximum width of 30 inches at the easterly end, where a 25-foot winze had been sunk. The bottom of the winze was covered by water, but the ore could be followed down, showing a width of about 8 inches. The ore appeared to be irregular in occurrence and its continuity indefinite. The westerly end of the lens "peters out" in the slates, so the length of the ore of minable width is limited to about 15 feet. It is understood that this occurrence is in close proximity to the boundary of the *Woolsey* group, and if continuous with depth will dip into this property.

No. 4 crosscut, driven at a short distance to the west of No. 3 to prospect surface showings in the bluff, cuts the vein and exposes a streak of galena between the slates and quartz, and about 2.5 feet of quartz with disseminated galena, suitable for mill-feed, if developed in quantity. The work done here indicates that ore in the quartz is bunched and mineralization of the quartz can only be expected where it has been subjected to fracturing. On the surface above the tunnel there is a narrow streak in the hanging-wall side of the vein.

At the No. 2 crosscut, near the No. 1 tunnel, a small amount of drifting has been done, which discloses a narrow streak of galena in slates along the foot-wall of the vein.

Other showings were examined on the *Snowflake No. 2* claim, at an elevation of 6,250 feet, where two parallel quartz veins some 30 feet apart have been prospected by two open-cuts. Similar conditions exist here as elsewhere, the galena occurring as irregular disseminations in the quartz and in narrow lenses on the foot-wall. Not enough prospecting-work had been done here to reveal the possibilities.

*No. 4 Level.*—Work is now being confined to driving a crosscut to explore the ground at a vertical distance of 500 feet below the upper workings. Driven in a direction of N. 40° E., it crosscuts the formation consisting of slates and limestone-bands. Its length was 390 feet. Near the face a narrow stringer containing zinc-blende and iron pyrites had been encountered. Silver values are reported to have been obtained at a point 260 feet from the portal and a sample was taken across 20 inches. Upon close examination this proved to be a dark, crushed limestone, cemented with quartz and calcite stringers; no metallic mineral was visible. This sample assayed: Silver, 0.4 oz. to the ton; lead, 0.45 per cent. It is stated that this crosscut will have to be advanced at least 500 feet more to reach the vein.

#### SHIPMENTS.

Ore won from the No. 1 and No. 3 levels was shipped to Trail. Last year the following shipments were made:—

August 2nd, 1927, 9,397 lb. Assay: Gold, 0.01 oz.; silver, 68 oz.; lead, 73 per cent.; zinc, 1.7 per cent.

November 7th, 1927, 57,544 lb. Assay: Gold, 0.01 oz.; silver, 56.2 oz.; lead, 60.4 per cent.; zinc, 7.9 per cent.

It is reported that another small shipment was made this year.

#### EQUIPMENT.

The property is equipped with a small oil-engine and compressor, constituting a very nice installation for the purposes for which it is required. The engine is a 2-cylinder vertical-type Ruston, and the compressor is a 2-cylinder Gardner having a capacity of 265 cubic feet a minute.

#### MANAGEMENT.

Everything at the camp appeared to be running smoothly and good results were being obtained.

The ingenious manner by which the plant, oil, and other supplies were hauled for 2,000 feet up a snowslide track during the winter certainly reflects credit on the management. About fifteen men are employed.

## REPORT BY F. W. GUERNSEY.

## SNOWFLAKE GROUP, REVELSTOKE MINING DIVISION.

## CLAIMS.

*Topnot No. 1, Topnot No. 2, Snowflake No. 1, Snowflake No. 2, Snowflake No. 3, Evening Sun, Sadler No. 1, Sadler No. 2, Comstock, Eureka Calumet, Heda, Bell Point (mill-site).*

## OWNER.

Snowflake Mining Company, Limited, 418 Standard Bank Building, Vancouver, B.C.

## LOCATION.

British Columbia, Revelstoke Mining Division, 8 miles from Snowflake Siding and 10 miles from Albert Canyon Station on the Canadian Pacific Railway. A good trail 4 feet wide leads from Snowflake Siding up Silver creek to the *Bell Point* claim. Two-wheel carts with a 3-foot gauge are used on this portion of the trail. From *Bell Point* to the main camp the trail is steep and can only be used by pack-animals.

The group lies on the ridge separating the East fork of Silver creek from the main stream.

## ORE-DEPOSITS.

The area is underlain by rocks of Pre-Cambrian age, mainly black carbonaceous slates called by Daly Metargillites. To the north on the *Topnot* claims quartzite is apparent, while on the southerly portion of the *Bell Point* claim the underlying limestone is exposed.

The slates have a general strike north-westerly and south-easterly, with a dip north-east, and contain numerous veins and veinlets of quartz, which generally are bedded with the formation, but in minor cases cut it at slight angles.

Wherever the quartz veins have a sizable width, with continuity of strike on the surface and show signs of lead mineralization, economic ore-shoots are liable to be developed.

In the area under consideration, on claims *Snowflake* and *Snowflake No. 2*, three such veins, respectively called veins No. 1, No. 2, and No. 3, have been exposed.

Vein No. 1 can be traced by open-cuts and outcrops from near the easterly boundary of the *Snowflake* claim for a distance of about 700 feet, beyond which point the outcrop is obscured by slide and talus material. The outcrop is fully exposed for a distance of about 500 feet and here shows a maximum width of 15 feet. A typical cross-section is about as follows: 12 inches of quartz heavily mineralized, 60 inches of slate, 50 inches of quartz sparingly mineralized.

The principal minerals contained in the vein are lead and iron sulphides and the economic values are in silver and lead, the galena (lead sulphide) apparently carrying these values. It was thought the pyrite (iron sulphide) might carry appreciable gold values, but this does not appear to be so, and the gold tenor of the ore is low. The zinc minerals are negligible.

The streak of quartz carrying the galena follows the foot-wall side of the lode. As will be noticed from the attached map, it is apparent in the vein on the surface for approximately 500 feet in length and the width of the streak varies from 4 to 20 inches. It appears in No. 1 tunnel and No. 3 tunnel and the crosscuts driven between, and has been followed below No. 3 tunnel for 23 feet by means of a winze. The development in No. 2 tunnel, however, does not show this streak, but there is more of a dissemination of minerals throughout the lode as shown wherever crosscuts have been driven through it. The development so far shows the pay-streak to have an average width of 12 inches for a distance of 500 feet and an average value of about \$70 per ton.

Two shipments made from the property were from this vein, principally from No. 1 and No. 3 tunnels, and the winze. The ore, as broken, was sorted, sacked, and shipped, the gross value being \$110 per ton and \$133 per ton respectively.

No. 2 vein can be traced by outcrops across *Snowflake* and *Snowflake No. 2* claims, or a distance of about 1,200 feet.

It has a strike parallel to No. 1 vein and lies at a distance of 140 feet to the north-east. The only work attempted on it has been by open-cuts, and in each of these lead-sulphide mineralization is shown.

The pay-streak lies on the hanging of this vein and has a width of from 8 to 14 inches, as shown by the open-cuts. The total width of vein observed varied from 4 to 8 feet, and the quartz has somewhat more mineral disseminated throughout it than is the case of No. 1 vein. It may be expected that further development will show an important tonnage of milling-ore in this lode.

No. 3 vein, lying 40 feet north-west of and running parallel to No. 2 vein, can be traced by means of outcrops across the *Snowflake* claim.

The only work on it has been an open-cut and trench on the *Snowflake* No. 2 claim, where a vein of quartz 3 feet in width, with a streak of 10 inches carrying lead and iron sulphides, is exposed. This streak averaged 77 oz. silver and 71 per cent. lead. A trench exposing the vein for 50 feet beyond the open-cut shows lead-sulphide mineralization all the way.

From the foregoing description it will be realized that No. 1 and No. 2 veins give every promise of developing ore-shoots of economic importance. It is seldom that one finds two veins so close together which have the showings that these have. Either of them alone would justify the expenditure of money to prove up, and the two together make a very attractive proposition. In addition, No. 3 vein offers a good mining chance, which any one might reasonably take.

There is every reason to assume that the mineralization exposed on the surface will extend to depth. The origin of the veins is deep-seated. Their lateral extension is great, and similar ore has been found on the assumed extension of No. 2 vein on the adjoining property, 1,500 feet lower in elevation.

The crosscut tunnel now being driven should cut No. 1 vein at a distance of 550 feet in the dip below the outcrop, and if continued on will cut the downward extension of No. 2 and No. 3 vein. There is no better way of prospecting these lodes than by this plan. After the lodes are cut, drifting to the right is recommended and as soon as a shoot of ore encountered a raise run to the surface. This will provide ventilation and assist in blocking out ore for future extraction. The present installation of machinery is of sufficient capacity to accomplish this work.

To the north on the *Topnot* claims a fourth vein has been reported. This was not seen, but what was said to be the eastern extension of it; on the adjoining group, was inspected. The outcrop here shows a strong quartz vein 20 feet in width, with a strike and dip parallel to No. 1 vein. Very little mineralization was apparent in this vein, and work will have to be done on it before proving or disproving its value.

While the present means of communications with the railway are fairly good, steps will have to be taken to improve them. A new bridge should be constructed over Illecillewaet river at Snowflake Siding, and the present trail, which is a good one, changed slightly in places and widened out to a wagon width.

This should be done from the railway to a point on the slope of the ridge above the *Bell Point* claim. From the main camp to the end of the road a surface tramway will afford the necessary connection. In the location of this, consideration must be given to the snowslide paths which come down the ridge-side.

While the nature of the deposit gives every encouragement to anticipate there will be a very considerable quantity of ore available, the data known are insufficient to say anything regarding tonnage or treatment of ore of a grade which will not pay to ship.

After further development of the lodes has been accomplished steps may be taken toward the establishment of a treatment plant and the installation of a larger power unit, which will be necessary. The question of water-power should be investigated and measurements of the stream-flows during the period of minimum discharge taken.

F. W. GUERNSEY.

Vancouver, B.C., August 24th, 1928.



TABLE OF ASSAYS ACCOMPANYING REPORT OF F. W. GUERNSEY.

No.	Width.	Gold.	Silver.	Lead.	Zinc.	Value per Ton.
	Inches.	Oz.	Oz.	Per Cent.	Per Cent.	
1.....	48	.....	13.8	9.4	.....	\$19.00
2.....	8	.....	12.2	9.7	.....	18.54
3.....	60	.....	4.7	4.0	.....	7.47
4.....	10	.....	77.3	71.7	.....	130.10
5.....	10	0.02	39.4	41.4	.....	71.65
6.....	6-18	0.02	49.6	49.6	.....	87.79
7.....	8	0.01	31.2	30.6	Trace	54.56
8.....	36	.....	0.8	0.6	.....	1.17
9.....	36	.....	0.6	0.4	.....	.82
10.....	14	0.01	15.4	21.4	.....	34.45
11.....	72	0.03	3.3	4.0	.....	6.36
12.....	14	0.02	0.6	0.4	.....	.38
13.....	16	0.02	18.6	47.3	.....	67.36
14.....	60	0.005	1.3	0.7	.....	.82
15.....	14	.....	36.2	46.2	.....	75.07
16.....	60	.....	11.0	16.3	.....	25.83
17.....	60	0.005	0.7	0.5	.....	.36
18.....	24	.....	25.1	24.6	.....	43.82
19.....	60	.....	14.6	18.9	1.4	30.64
20.....	10	0.03	63.2	66.4	.....	116.28
21.....	96	Trace	1.9	2.5	.....	4.08
22.....	.....	Trace	0.7	.....	.....	.40
23.....	131	.....	3.1	3.2	.....	5.60
24.....	72	Trace	1.9	2.6	.....	4.08
25.....	.....	.....	0.5	0.3	.....	.35
26.....	6	.....	6.4	2.5	.....	6.64

## REPORT BY JOHN D. GALLOWAY, PROVINCIAL MINERALOGIST.

## SNOWFLAKE GROUP, REVELSTOKE MINING DIVISION.

## GENERAL STATEMENT.

The *Snowflake* property is situated on Clabon creek, about 10 miles from Albert Canyon Station on the main line of the Canadian Pacific Railway. The property, which consists of twelve claims, was acquired by the Snowflake Mining Company, Limited, early in 1927. The capitalization is 2,500,000 shares of a par value of 50 cents, of which approximately 1,655,000 shares have been issued.

The property is reached by trail from Snowflake Siding, 2 miles west of Albert Canyon Station. From this point a 4-foot trail on a good grade extends  $5\frac{1}{2}$  miles to the lower camp on the *Bell Point* claim. On this trail two-wheel trucks with a horse are used for haulage. From the lower camp to the mine-workings a narrow and somewhat steeper trail is used which is only suitable for pack-horses.

The group adjoins the *Woolsey* group and lies on the ridge separating the East fork of Woolsey (Silver) creek from Woolsey creek. The elevation of the lower camp is 3,800 feet; No. 4 tunnel, 5,550 feet; No. 3 tunnel, 5,855 feet; No. 2 tunnel, 5,890 feet; and No. 1 tunnel, 5,960 feet.

The topography is mountainous, with steep side-hills, which in places are swept by snow-slides. The location is fairly suitable from a mining view-point, as the distance from the railway is not excessive and a short tramway would bring ore to a suitable point for delivery to a motor-road.

Timber for mining purposes is available and hydro-electric power could be generated for mining and milling.

The property is now equipped with a 50-horse-power Diesel engine and compressor. Suitable camp buildings have been provided and a crew of twelve to fifteen men is employed. It is intended to continue development during the winter.

## GEOLOGICAL FEATURES.

In the vicinity of the workings the formation consists mainly of black carbonaceous slates and argillites, but some of the bands are siliceous and some slightly calcareous. The slates have a general strike of north-west, with a south-easterly dip of about  $45^\circ$ . This formation has been classified as being of Pre-Cambrian age.

To the north it is reported that quartzite occurs and to the south, limestone, but these outcrops were not examined. At some distance away granite is said to be intrusive into the sedimentary formation.

There are several quartz veins outcropping on the property which generally conform in strike and dip with the enclosing slate formation. Three of these have been worked upon and these were examined. A fourth, reported to have been recently discovered, was not examined.

These veins are quartz-filled fissures, but in many places the fracturing has only permitted the formation of stringers of quartz in the slate; in other places widths of 6 to 8 feet of quartz occur. These quartz veins are regular and well defined and can be traced at intervals on the surface for hundreds of feet. No. 1 vein is said to be a continuation of the No. 5 vein on the *Woolsey* group, and if so has a continuity of 2,000 feet or more. There is little or no faulting of the veins in evidence so far as development has proceeded.

The veins are sparingly mineralized with galena, pyrite, and zinc-blende. It is quite apparent that the quartz represents a primary filling and that later refracturing of the quartz permitted the deposition of the metallic minerals.

In the upper workings galena and pyrite are the only important metallic minerals present, the zinc content being unimportant. In the No. 4 tunnel, where the No. 1 vein was crosscut, zinc-blende and pyrite were found, but the galena content is negligible so far as development had gone at the time of examination.

Assays show that the silver content of the ore runs nearly an ounce of silver to the unit of lead. The zinc-blende carries practically no silver and no appreciable gold values are found.

## DESCRIPTION OF VEINS AND WORKINGS.

Up to the present time practically all development on the *Snowflake* group has been on the No. 1 vein. It has been traced on the surface for a distance of about 700 feet. The vein usually consists of a band of quartz on both walls and an intervening band of slate. Considered as one vein, it has a total width of from 5 to 15 feet in the upper workings. In the lower crosscut (No. 4) the bands of quartz are separated by a greater width of barren slate, giving an appearance of a very wide vein. The total width of quartz in the lower crosscut, however, is not much greater than in the upper workings. In places the slate-bands contained in the vein have small quartz stringers in them.

The upper workings are fully described in the previous reports on the property, but a brief summary may be useful.

The No. 1 vein is the only one that has been explored by tunnels, the Nos. 2 and 3 being opened up by open-cuts and stripping.

Four tunnels have been driven on the upper workings of No. 1 vein. No. 1 tunnel is a drift on the vein about 50 feet in length. Near the portal a cross-slip cuts into the vein at right angles to the dip and a small lens of good-grade galena occurs at this point. Some shipping-ore was taken out here and there is still some left, but there is no appreciable tonnage of milling-ore developed.

The No. 2 tunnel, which is 50 feet below the No. 1, is a crosscut for 150 feet, to where it cuts the vein. A drift was run 22 feet to the east and 118 feet to the west, and three crosscuts from this drift run to the hanging-wall. This working shows the vein to be from 5 to 12 feet wide, of banded quartz and slate. It is very sparingly mineralized with galena. A band of pyrite 6 to 12 inches wide is fairly continuous along the foot-wall, but a selected sample of this (No. 11) shows no values. A sample (No. 9) across 10 feet 9 inches in No. 1 crosscut showed unimportant values.

No. 3 tunnel is a short crosscut to the vein and then a drift. The vein, which crops out nearly at the portal of the tunnel, is slightly broken over and irregular in this working. It is a zone of maximum fracturing of the primary quartz and is characterized by the best development of galena on the property. From a point in the drift to the east a winze has been sunk 24 feet. In places this working shows a band of galena from 2 to 3 feet wide, and in others galena is disseminated across 2 to 6 feet of quartz. A sample (No. 6) taken across 4 feet 8 inches at the top of the winze, where the vein is flattened out, showed good-grade ore.

In the drift to the west in No. 3 tunnel the vein is not nearly as well mineralized as in the east drift and winze. A sample (No. 7) taken across 18 inches at the face of the west drift showed no commercial values.

While there is a certain amount of ore exposed in the winze and short east drift, the lenticular and irregular nature of the ore occurrences is such that no tonnage of ore can be estimated as being developed.

No. 3 crosscut tunnel, 22 feet long, and crosscutting the total width of vein at this point, shows first on the foot-wall 5 feet 10 inches of quartz, then 3 feet 2 inches of slate, 5 feet 7 inches of mixed quartz and slate, and 7 feet of slate. Disseminated mineralization shows in the quartz-bands. A sample (No. 8) shows good mill-feed at one point, but the general average would be somewhat lower grade.

The No. 2 vein lies about 140 feet to the north-east and approximately parallel to the No. 1 vein; the No. 3 vein lies another 40 feet to the north-east of No. 2 vein.

No. 2 vein varies from 2 to 6 feet in width of quartz and slate. It is mineralized with disseminated galena and pyrite. In places a clean band of galena from 6 to 12 inches wide occurs on the foot-wall.

No. 3 vein is about 3 feet wide and shows slight mineralization with galena. This vein has been stripped by means of a trench, but owing to snow could not be properly examined. It is said to show a streak of clean sulphide 10 inches wide.

A lower crosscut tunnel was started at an elevation of 5,550 feet, or 410 feet below the No. 1 tunnel. This gives a depth of about 600 feet on the dip of the vein below the upper workings. At a point somewhat over 900 feet from the portal this crosscut penetrated the No. 1 vein.

A section from the foot-wall to what is called the hanging-wall is as follows:—

Description.	Width. Ft. in.
Well-defined quartz-band, mineralized with pyrite and zinc-blende (No. 1 and No. 10 samples) .....	6 10
Slate with few quartz stringers, 90 per cent. slate; some pyrite and very slight zinc-blende (No. 2 sample) .....	3 5
Slate, very few small quartz stringers unmineralized (No. 3 sample) .....	15 8
Mainly quartz slightly mineralized with zinc-blende and pyrite (No. 4 sample) .....	4 0
Slate; unmineralized (No. 5 sample) .....	7 4
Slate to hanging-wall .....	8 6

In this total width of material between the apparent walls the only true vein-filling is in the two bands of quartz, respectively 6 feet 10 inches and 4 feet wide. There is no appreciable galena in the vein as developed on this level.

The results of sampling of the different sections of the vein are shown in the table of assays. They show plainly that over the widths sampled there is no commercial ore—either shipping or milling—in the vein, so far as it has been developed on this level.

On the foot-wall there is a band of zinc-blende and it is probable that a sample across 12 inches would show a zinc content of perhaps 25 per cent.

Drifting in the foot-wall alongside the vein had been commenced at the time of examination and it was intended to explore the quartz-band next to the foot-wall.

VALUES, ASSAYS, AND ESTIMATE OF ORE.

In 1927, 34 tons of hand-sorted ore was shipped, containing (gross) 1,936 oz. silver, 40,779 lb. lead, and 4,705 lb. zinc. The net smelter returns to the company were \$2,292.55, or \$67.04 a ton.

In 1928, 44 tons of hand-sorted ore has been shipped, assaying 41.6 oz. silver and 53.9 per cent. lead, netting the company \$1,839, or \$41.80 a ton.

The various assays given in the previous engineer's reports show the grade of ore found in the upper workings on this property. It should be remembered, in considering lead and zinc values, that the net return to the shipper at present metal prices is not more than 40 cents a unit. This means that an ore carrying 10 oz. silver, 10 per cent. lead, and 10 per cent. zinc would net to the shipper approximately \$13.50 a ton after all smelting, refining, and marketing charges were deducted. In many assay results the figure of value per ton for the ore is obtained by calculating the contained metals at the full market price of the refined metals. With average silver-lead-zinc ore, at present metal prices, the net value to the shipper is less than half the gross value.

The following table shows the results of assays of samples taken by the Provincial Mineralogist:—

Sample No.	Description of Sample.	Gold.	Silver.	Lead.	Zinc.
		Oz.	Oz.	Per Cent.	Per Cent.
1	No. 4 tunnel, across 6 feet 10 inches starting from foot-wall, east side of crosscut.....	Trace	1.0	Nil	8.6
10	No. 4 tunnel, across 6 feet 5 inches starting from foot-wall, west side of crosscut.....	Trace	2.0	Trace	14.0
2	No. 4 tunnel, across 3 feet 5 inches next to sample No. 1.....	Nil	Nil	Nil	Trace
3	No. 4 tunnel, across 15 feet 8 inches next to sample No. 2.....	Trace	Trace	Nil	Nil
4	No. 4 tunnel, across 4 feet next to sample No. 3.....	Trace	1.5	Trace	1.0
5	No. 4 tunnel, across 7 feet 4 inches next to sample No. 4.....	Trace	Trace	Nil	Trace
6	Across 4 feet 8 inches in No. 3 tunnel at top of winze....	Trace	40.0	42.0	Trace
7	Across 18 inches face of west drift, No. 3 tunnel.....	Trace	2.4	1.0	Trace
8	Across 5 feet 10 inches in No. 3 crosscut tunnel.....	Trace	19.5	18.0	Trace
9	Across 10 feet 9 inches in No. 1 crosscut of No. 2 tunnel .....	Trace	2.2	Trace	1.0
11	Selected specimen of pyrite to determine values in gold and silver.....	Trace	0.3	.....	.....
12	Selected specimen of zinc to test for silver content in zinc .....	Trace	5.2	.....	53.0

The clean galena was not sampled as many previous assays show that it runs fairly uniformly from  $\frac{3}{4}$  to 1 oz. of silver to the unit of lead.

From a consideration of the returns of hand-sorted ore shipped in 1927 and 1928 it is apparent that there is no great margin of profit in this procedure, as out of the net smelter returns must be deducted mining and sorting costs, transportation to the railway, and miscellaneous costs. The irregular occurrence of the bands and lenses of galena show that but little hope of profits can be entertained by means of mining and shipping hand-sorted ore.

The future possibilities of the property lie in the possible development of continuous shoots of milling-ore over minable widths. So far as at present developed, the writer would not estimate that any appreciable tonnage of milling-ore has been proven or indicated.

The cutting of the vein in No. 4 crosscut tunnel demonstrates the continuity of the vein at that depth, but the absence of commercial values and the zincky nature of the mineralization are somewhat disappointing.

The further development of the vein on the No. 4 crosscut level by drifting is advisable and it is possible that shoots of commercial ore may be discovered.

#### SUMMARY.

The *Snowflake* group contains quartz veins which contain lenses and bands of lead-zinc-iron sulphides. At the surface galena predominates amongst the metallic minerals, while at the No. 4 crosscut level, so far as developed, galena is nearly absent and some zinc-blende and pyrite are found disseminated in the quartz-bands.

The galena is valuable as it contains silver, whereas the zinc-blende carries but little silver. The pyrite is unimportant as it does not carry appreciable gold or silver values.

So far as development has gone, no important quantities of shipping-ore have been proven. In the upper workings on the No. 1 vein milling-ore is indicated in several places, but as yet no appreciable tonnage is proven. No commercial ore has been found in the No. 4 crosscut tunnel.

The cutting of the vein in the No. 4 crosscut tunnel demonstrates the continuity of the vein at that depth, but not of the values. Further development by drifting on this level, however, may disclose shoots of galena ore.

The other veins on the property are similar to the No. 1 vein. They are parallel veins and can be developed by continuation of the No. 4 crosscut tunnel. Development of these should be left in abeyance until the economic value of No. 1 vein is demonstrated.

The property is still a prospect in the development stage, with the possibility of commercial ore-shoots being found, where structural conditions are favourable by reason of sufficient fracturing of the primary quartz to permit extensive replacement by metallic minerals.

While these possibilities are recognized, the nature of the mineralization is such that extensive development will be required to prove the property.

It is obvious that all considerations of mill-construction, power-development, etc., should be left in abeyance until substantial ore-bodies are found.

## REPORT BY F. W. GUERNSEY.

## SNOWFLAKE GROUP, REVELSTOKE MINING DIVISION.

November 2nd, 1928.

E. J. Cameron, Esq.,  
Managing Director, Snowflake Mines Co.,  
Vancouver, B.C.

DEAR SIR,—The development proceeding at the *Snowflake* property, I consider gives encouraging assurance for the future.

The main crosscut cut No. 1 vein near the point expected, and although the metallic mineral carried in the vein is mainly zinc sulphide and the silver values lower than what was obtained at the outcrop, the fact that mineralization was contained in the vein at the point where cut is favourable.

The No. 1 vein where crossed is between 5 and 6 feet in width and carries a streak of 10 inches of quartz heavy in zinc sulphides. A sample cut, 60 inches in width, assayed 0.8 oz. silver and 9.2 per cent. zinc. The 10-inch streak gave 2.3 oz. silver, 0.2 per cent. lead, and 24.2 per cent. zinc.

The crosscut was continued and 20 feet farther on cut another vein of banded quartz, 4 feet in width, carrying 2.6 oz. silver, 1.7 per cent. lead, and a trace of zinc.

It could not be determined whether these two veins were separate lodes or splits from No. 1 vein. At some points on the surface the outcrop is shown with a slate parting, and it is quite possible that these two exposures are the downward extension of the outcrop.

A drift has been driven to the west, starting in the foot-wall, and at the time of my visit was in 35 feet. Near the face of this drift a few shots were put in, exposing a portion of the vein first cut by the crosscut. Thirty-six inches of this is banded quartz and slate which on assay gave 4.2 oz. silver, a trace of lead, and no zinc. From the upper corner of the drift, where the edge of the vein was exposed, 14 inches of a sample gave 4.7 oz. silver, 3.5 per cent. lead, and 5.8 per cent. zinc. Instructions had already been given to turn the drift to the north, cut the vein, and follow the mineralization, and it is recommended that when driving either east or west the drift follow as closely as possible the vein.

The new vein, No. 4, was examined. The outcrop shows this to be from 1 to 3 feet in width, with a streak of lead sulphide about 3 inches in width. Samples of this streak gave 14.4 oz. silver and 23 per cent. lead. The strike of the vein is parallel to the others and lies about 150 feet from No. 3 vein. The mineralized streak appears for 170 feet on the outcrop exposed on the north slope of the ridge.

Work is going ahead in preparation for the erection of additional buildings to take care of a greater number of men. Owing to the limited accommodation at present, the work underground will be retarded somewhat, as every available man is required to prepare the foundation for the additional living-quarters. It may be expected, therefore, that for some time reports of progress underground will not show any great advance.

On the *Woolsey* property, lying to the east, at the time of my visit the crosscut being driven cut a vein which carries a very good showing of lead and zinc sulphides. This is at an elevation 1,100 feet below the *Snowflake* crosscut and is an indication of the extent of the mineralization in these veins. It is not known what particular vein this is, although it is stated it was the *Snowflake* No. 3. This, however, is rather conjectural.

While the values in the vein cut by the No. 4 crosscut may not be as high as were expected, when one realizes that the crosscut is over 900 feet in length and cuts the vein about 550 feet below the apex, and that it is exceptional to strike one's objective so closely at such distances, it may be termed lucky that any metallic mineralization was found at the point of intersection. This occurrence also suggests how extensive the mineralization along the zone is.

Yours truly,

(Signed) F. W. GUERNSEY.

## REPORT ON WAVERLEY-TANGIER PROPERTY. REVELSTOKE MINING DIVISION.

The *Waverley-Tangier* property has recently been acquired by a company known as the Waverley-Tangier Mines, Limited (N.P.L.), with a capitalization of 16,000,000 shares of 25 cents par value. The president of the company is J. B. Williams; vice-president, E. J. Cameron; and consulting engineer, W. Orville Young.

The following report by B. T. O'Grady has been prepared as a result of an examination made in October, 1928; and is now published in order to answer the numerous inquiries that have been received by the Department of Mines for information on the property.

### REPORT BY B. T. O'GRADY, ASSISTANT RESIDENT ENGINEER.

#### GENERAL STATEMENT.

This property is situated at the head of the North fork of Downie creek, about 1½ miles below the summit flats separating that creek from Tangier river (North fork of the Illecillewaet river), and is reached by an old wagon-road about 28 miles in length which follows the Tangier river from Albert Canyon, on the main line of the Canadian Pacific Railway, 21 miles east of Revelstoke.

The old road, which contains many adverse grades and which is exposed to numerous snow-slides of an aggregate length of several miles, is obliterated in numerous places and is now in such bad condition that it only amounts to a very poor trail over which pack and saddle horses can only be taken for a few months in the summer and fall.

The trail climbs from an elevation of 2,224 feet above sea-level at Albert Canyon to an elevation of about 6,000 feet on the summit flats forming the watershed separating the North fork of Downie creek from Tangier river, then branches into one trail leading to the No. 3 tunnel of the *Waverley* at 5,700 feet elevation, and another trail leading to the *Tangier* shaft at 4,800 feet elevation. The great depth of snow and numerous snowslides throughout the upper 12 miles of the trail are a severe handicap in the winter and spring.

The old workings, which are quite extensive, date back to 1897 and 1898, when the property was operated by the Gold Fields of British Columbia, an English company, which after spending, according to reports, over a million dollars, in 1900 went into liquidation and was wound up voluntarily. Subsequently the liquidator sold the three principal claims on which all the work was done to Cecil A. Boyd, Ole Sandberg, and Tom Graham for "divers and valuable considerations and in consideration of the sum of one dollar."

In 1918 these claims were turned over by Boyd, Graham & Sandberg under lease and bond to G. H. Walters, of Spokane, who consummated the purchase in 1920. The Waverley Mines Company was subsequently formed at Spokane to operate the property. Since then a few men have been employed during the summer months of each year. The work done since 1918 by this company includes a small amount of tunnelling on the *Waverley*, the situation in regard to ore developed being much the same as when the old English company abandoned the property. Recently a new company called the Waverley-Tangier Mines, Limited (N.P.L.), of Vancouver, has apparently become connected with the undertaking.

The *Waverley-Tangier* groups at the present time comprise three Crown-granted claims—the *Montague*, Lot 3596; *Waverley*, Lot 3597; and *Tangier*, Lot 3600, which are the claims mentioned in the above-described transactions—and thirteen un-Crown-granted claims. The Crown-granted claims were registered at Nelson in January, 1928, in the name of the Waverley Mines Company, of Spokane. The Waverley-Tangier Mines, Limited, has an agreement to purchase the properties from E. J. Cameron and W. H. Hughes. Two mortgages, amounting to \$34,742.90, are registered against the thirteen un-Crown-granted claims, which are recorded in the name of the Waverley Mines Company, of Spokane.

The formation of the area consists of conformable beds of siliceous and argillaceous limestones, quartzites, and schists, which have a north-west and south-east strike, dipping to the north-east. Both the *Waverley* and *Tangier* deposits occur in limestone and metamorphosed calcareous rocks. The property includes two separate mines situated several thousand feet apart.

#### WAVERLEY.

When this mine was visited in 1921 a considerable portion of the workings was inaccessible from caving, but now that it is possible to examine these other workings more information is available and some revision of and additions to the writer's previous report will be necessary.

The claims in this group are located diagonally along the steep mountain-side from an elevation of from 5,600 to 7,200 feet above sea-level. Practically all the development was done on the *Waverley* and *Montague*, principally on the former.

The main vein, known as the *Montague* vein, conforms to the bedding of the country-rock and can be traced by open-cuts and stripping for a considerable distance along the outcrop. This vein, which on the surface varies from 1½ to 4 feet in width, strikes north-westerly, with a steep dip to the north-east.

The mineralization consists chiefly of carbonates containing occasional small nodules of galena, the gangue being composed of altered and decomposed country-rock and quartz. Some of the ore shows copper-stains, possibly derived from the decomposition of a grey-copper mineral.

The exposures in the surface cuts on the *Montague* vein indicate widely separated short and narrow lenses of ore. Nine samples taken along the outcrop workings across an average width of 2½ feet gave an average of: Gold, 0.02 oz. to the ton; silver, 15 oz. to the ton; lead, 10.7 per cent.

The principal group of workings crosscut and develop a shoot of ore on the *Waverley* throughout a vertical depth of about 374 feet. In the case of this ore-shoot replacement of limestone has occurred over a considerable width at the intersection of a cross-vein, the ore-body being roughly triangular in plan and wedge-shaped in section or tending to converge at depth.

It will be noted that the large width of ore in the upper part of this ore-body is only a local condition due to special geological conditions which are not repeated, as far as known at present, throughout the explored sections of the long and narrow vein outcrop.

This lens of ore, which has an apparent average length of about 70 feet and a maximum width of about 40 feet, is developed by No. 2 and No. 3 tunnels and connecting winze and raise, from which three intermediate levels have been driven.

Ore in these workings is exposed at the top of the ore-body in No. 2 tunnel at an elevation of 6,074 feet, and in the intermediate levels at elevations of 6,005, 5,895, and 5,790 feet respectively.

The downward extension of the ore-body has not yet been found on the No. 3 crosscut tunnel level, which is at an elevation of 5,700 feet, and further exploration is necessary to determine if it reaches this level.

Conditions made it impracticable to do the large amount of sampling which would be necessary to determine the average values of the ore exposed in these workings. The few samples taken by the writer are of little value except to determine that the ore is too low grade to ship, and that before it could be turned to account some method of milling would have to be evolved, if possible, whereby silver bullion and high-grade concentrates could be produced.

The ore in this shoot has been thoroughly sampled by reliable engineers, however, and the results made available to the writer indicate average values of: Silver, 17.7 oz. to the ton, and 5.8 per cent. lead over an average width of 7 feet and a length of about 70 feet.

Regarding possible tonnage developed in these workings, it is impossible to estimate tonnage at all accurately owing to the irregular character of the ore-deposition. Fifteen thousand tons would, however, be a liberal estimate of the tonnage to be expected from present exposures.

The No. 1 tunnel, at an elevation of 6,158 feet and some distance to the north-west of the principal ore-body just described, develops the *Montague* vein just below its outcrop.

These workings consist of a short tunnel and a winze in which the vein varies in width from 14 inches to 2 feet. A sample across 2 feet at the top of the winze assayed: Gold, 0.06 oz. to the ton; silver, 39.02 oz. to the ton; lead, 17 per cent.

About 750 feet to the north-west (estimated) of the No. 1 tunnel, and at about the same elevation, there is a shallow winze at the end of a short crosscut to the *Montague* or main vein.



The ore in this winze, which consists of carbonates containing streaks of galena, is up to 4 feet wide, and a sample across this width assayed: Gold, 0.02 oz. to the ton; silver, 14.4 oz. to the ton; lead, 14.9 per cent.

In regard to the No. 1 tunnel and the last-mentioned working, it will be noted that insufficient work has been done on which estimates of appreciable tonnage can be based.

Summarizing the situation regarding the above-described *Waverley* deposits, it may be said that a much larger tonnage would have to be developed, and a satisfactory metallurgical process evolved, before costly milling plant would be justified.

#### TANGIER.

The claims of the *Tangier* group are located along the creek immediately below and southwest of the *Waverley* group at an elevation of 4,800 feet (collar of shaft).

Outcropping along the creek-bed there is a well-defined fissure-vein with a similar strike and dip to the *Montague* vein, also conforming to the bedding of the country-rock, which can be traced for a considerable distance along the surface by occasional open-cuts and stripping. This vein, which varies in width from 1½ to 5 feet, contains in places small bunches of galena, zinc-blende, and occasional streaks of a grey-copper mineral in a gangue of quartz, calcite, and altered limestone.

The shaft was sunk on a mineralized zone in calcareous rocks lying on the foot-wall side of the vein at some little distance from it. The vein itself was not recognized in the underground workings, which apparently did not reach it.

The development on the *Tangier* consists approximately of 110 feet of double-compartment shaft, from 800 to 900 feet of tunnelling, and a 100-foot winze. The shaft is situated on the *Tangier* claim a short distance from and a little above the creek. The mineralization developed in the workings, which is indefinite and irregular, is of the replacement type, possibly in a zone of cross-fracturing connected with the above-mentioned vein.

No ore-body of definite dimensions was noted which could be sampled to advantage. The ore piled on the dump, amounting to possibly several hundred tons, consists chiefly of galena, zinc-blende, and pyrite in a siliceous and calcareous gangue. A grab sample from this large pile of ore assayed: Gold, 0.06 oz. to the ton; silver, 16 oz. to the ton; lead, 8.5 per cent.; zinc, 5 per cent. A picked sample of pyrite and quartz from the same pile gave: Gold, 5.6 oz. to the ton; silver, 8.2 oz. to the ton. This last sample, however, did not represent any appreciable quantity and was only taken to ascertain the gold tenor of the pyrite.

There is a separate pile, roughly estimated at 200 tons, near the shaft-dump of black decomposed ore which apparently came from the winze below the 100-foot level. A grab sample of this material gave: Gold, 0.24 oz. to the ton; silver, 21.2 oz. to the ton; lead, 8.5 per cent.; zinc, 15 per cent.

The workings are briefly as follows: A vertical double-compartment shaft was sunk for a depth of 110 feet. A short surface tunnel north of the shaft was run in and encountered some ore, connection being made with the shaft at shallow depth. Records show a small stope was started from this level and continued to the surface, the ore being stored in a pile below the shaft dump.

At the 100-foot level drifts were run north-westerly and south-easterly, encountering two mineralized zones, one on each side of the shaft. The ore-shoot in the south-east drift, having the strongest showing, was prospected by a 100-foot vertical winze. At the time of the examination this was partly filled with water. A grab sample from a small pile of black decomposed material around the collar of the winze gave: Gold, 0.16 oz. to the ton; silver, 35.6 oz. to the ton; lead, 11 per cent.; zinc, 3 per cent.

This mineralization in the south-east drift on the 100-foot level has an apparent length of 40 feet and a width of from 4 to 6 feet. A sample across 6 feet in the face of the drift gave: Gold, 0.1 oz. to the ton; silver, 3.7 oz. to the ton; lead, trace; zinc, 1 per cent.

The north-westerly drift shows little mineralization, a sample across 4 feet giving: Gold, trace; silver, 0.8 oz. to the ton; lead, *nil*; zinc, 2.5 per cent.

In addition to the above workings, several hundred feet of tunnels have been run in barren limestone, in which there are numerous open fissures and calcite-seams.

From an analysis of the samples taken it is obvious that there is no appreciable tonnage which would stand shipment even with the best of roads. The mineralization exposed in the

underground workings is very low grade and of an indefinite and irregular character. This condition, together with the insufficient information afforded by these workings, make it impossible to estimate any appreciable tonnage of material of commercial value.

The large pile of sulphide ore on the dump, previously referred to, is the only material seen which could be considered to be of any commercial value, provided a large tonnage of similar material, justifying milling plant, could be developed. The black decomposed material mentioned above would have to be found in very large quantities to justify metallurgical tests whereby it might be turned to account.

Late in September last it was reported that very high-grade "silver-bromide" ore had been found along the outcrop of the *Tangier* vein in shallow cuts several thousand feet away from the shaft workings. When the property was last visited early in October a heavy fall of snow made it impracticable to examine these cuts. It is extremely unlikely that a silver-bromide mineral was found, but probably that blue carbonate-stains derived from the oxidation of a copper mineral were mistaken for the other very rare mineral.

#### SUMMARY.

The *Waverley-Tangier* properties, on which former development was not brought to full and proper conclusions in spite of a reported expenditure of over a million dollars by the old English company, are handicapped by their difficult and isolated position, especially during the winter and spring months.

For the further testing-out of these properties economically on any appreciable scale a large initial expenditure would be required on the reconstruction of the old road, considerable portions of which would have to be relocated to eliminate adverse grades.

The two men employed at the mines were withdrawn about the end of September shortly before a heavy fall of snow which blocked the upper end of the trail for horse traffic. Under present conditions it would be impossible, within reasonable economic limits, to maintain and supply a crew of men at the *Waverley-Tangier* during the winter and spring, and it would be physically and economically impossible to ship any appreciable tonnage of crude ore at any time of the year.

Much further development will be required before it can be said that any substantial tonnage of ore is blocked out, sufficient to warrant the construction of a mill.

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