OROFINO GOLD

Thin Section Study

The relationship of the acid dykes to one another and to the ore has presented an interesting problem at the Orofino mine. Both lamprophyre and feldspar porphyry are younger than the quartz veins.

In mapping underground, it was found difficult to separate the narrow dykes of lamprophyre and porphyry from one another and even from the older diorite.

Nine thin sections were made of dyke rocks taken at various places on the 150-foot level, and these were studied microscopically.

Conclusions

Three ages of acid dykes occur on the 150-foot level at the Orofino mine. They are:

(1) Biotite Lamprophyre (youngest)
(2) Feldspar Porphyry (older)
(3) Aplite (oldest)

The age relationship between (1) and (2) is indicated in Specimen No. 33, taken in the north crosscut 28 feet north of survey point 119. In this specimen there is a contact between feldspar porphyry and biotite lamprophyre. The identity of these rocks is confirmed by specimens 31 and 32, taken from the coarser parts of the porphyry and lamprophyre several feet from the contact. In specimen 33 the porphyry is coarse and porphyritic to the contact, with albite phenocrysts at the contact half removed by the intruding lamprophyre. The lamprophyre is fine textured and highly altered close to the contact and somewhat foliated parallel to the contact. Alteration, which is to chlorite, sericite and carbonate decreases away from the contact.

The narrow, generally flat, sheet-like masses, generally termed lamprophyre underground, are aplitic in character, with minor quartz, and abundant feldspar in the orthoclase - albite range. They are more highly altered than either the biotite lamprophyre or the porphyry. Evidence underground in the east drift on No. 1 South vein shows the age relationship with the porphyry.

It seems probable that the aplite sheets and dykes are closely related genetically to the porphyry, and closely preceded it. There is evidence underground that the sheet of aplite exposed in the east drift has been re-opened and the later fractures filled with a fine grained phase of porphyry.

Nelson Hogg,
Resident Geologist.

Timmins, Ontario.
January 24, 1951

COPY

Mr. H. T. Leslie

S. C. Brown

Orofino Mines Ltd.,
Nov. 28th, 1946
TIONAGA, Ont.

DIAMOND DRILL HOLE SAMPLES

The following samples were cut to delimit the indicated ore sections in the following holes.

Hole No.	Footage	Width	Sample No.
37	98.5 - 99.5	1.0	6007 - NIL
39	147 -150	3.0	6008 - .01
39	174 -176	2.0	6009 - TRACE
41	119 - 121.5	2.5	6010 - .01
6	321 - 323	2.0	6011 - TRACE
8-1	212 - 214	2.0	6012 - TRACE
27	195 - 197	2.0	6013 - TRACE
27	199.3-200.3	1.0	6014 - 0.01
31	310 - 312.5	2.5	6015 - TRACE
33	316.5-318.5	2.0	6016 - TRACE
35	4.5-6.5	2.0	6017 - TRACE
35	124 - 126	2.0	6018 - TRACE
25	24.5 - 25.5	1.0	177 Assay 0.01 oz.

Yours very truly

"Stewart Cameron Brown"

OROFINO MINES LTD.

Silk & Horwood Twps.

List of Specimens

(1) Contact between Feldspar Porphyry and Diorite Ore (See Show case)

(2) Ore - No. 2 Vein - Grade about 3 oz./ton.

(3)
(4)
(5)
(6)
(7) } Diorite, showing gradation from coarse textured fresh diorite to chloritic diorite in ore zone.

(8) D.D.H. 57 317' - Diorite from vertical hole at shaft - See Thin Section.

(9) D.D.H. 3, 266' - Biotite Lamprophyre.

(10) D.D.H. 57 277' - Contact - Diorite and Feldspar Porphyry.

(11) Contact between grey lamprophyre and feldspar porphyry.

(12) Contact between diorite and biotite lamprophyre.

(13) Contact between grey lamprophyre and diorite.

(14) Biotite Lamprophyre.

(15) Grey Lamprophyre.

(16) Feldspar Porphyry.

(17)
(18)
(19)
(20) } Specimens of Ore - See Show case.

(21) 150-Foot Level - No. 1 South Vein - High Grade Seam on Footwall Fault, with Pink Alteration.

(22) 150-Foot Level - No. 5 Vein - North Cross-cut. - Brecciated Diorite with Visible Gold

(23) 150-Foot Level - No. 1 South Vein - Ribbon Quartz from Centre of Quartz Vein

(24) 150-Foot Level - No. 1 South Vein - Quartz with Galena and Visible Gold

September 1st to 15th, 1950, Advance in drifting and crosscutting 292.5 feet, plus slashing.

275 Foot Level

Drifting on the No.1 South Vein has been extended 185 feet west from the shaft. The first 100 feet gave a cut average of 0.80 over an average width of 3 feet. The average values over the balance of the drift are not available yet.

Drifting on this No. 1 South Vein to the east has been extended 116 feet from the north crosscut, that is, approximately 166 feet east of the shaft. Values so far obtained average approximately 0.30. (amount)

The north crosscut follows a north trending fault, along which the lateral displacement is about 20 feet.

At a point 150 feet north of the No. 1 South Vein the No. 1 North Vein has been intersected on the west side of the fault, and should be again intersected within 20 feet on the east side.

In the south crosscut mineralization extends for a distance of over 80 feet. Average of 200 car samples gave 0.10, and channel samples gave from 0.06 to 0.83. As this is something new, the potentialities of this wide zone of mineralization will not be known until further work has been carried out.

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150 Foot Level

The No. 1 North Vein has been located east of the fault (same fault as on 275 foot level north crosscut), and drifting started. Muck samples of 26 cars (2 tons each), gave average value of 1.01 oz. Slashing on the west side of the fault shows the ore to be approximately 12 feet wide at this point.

General

The north crosscut on the 275 foot level is to be extended to the north east to intersect the downward continuation of No. 5 Vein from the 150 foot level, and continue into an area where other veins exposed on the surface should be located in the underground.

OROFINO MINES

Silk and Horwood Twps.

by R. Hogg
Rev. Dec.
1950

Notes on Underground Workings

Two days, April 4th and 5th, were spent at the mine, examining underground workings on the 150-foot level. The 275-foot level was full of water, and it was therefore not possible to examine it. Work underground was still in progress.

Development

On the 150-foot level, 1150 feet of development headings had been completed, split up as follows:

(1)	Cross-cutting	490 feet
(2)	Drifting on No. 1 South Vein	500 feet
(3)	Drifting on No. 1 North Vein	150 feet
(4)	Slashing on No. 5 Vein (North Cross-cut) ...	10 feet

On the 275-foot level, very little development has been carried out. The station has been cut, and a few rounds of cross-cutting completed.

Geology

Most of the workings are in diorite, which is the host rock for the ore. Both diorite and ore are cut by feldspar porphyry and "lamprophyre" dykes. The porphyry is a reddish type with white phenocrysts, and it occurs in steep-walled dykes, which generally strike about N. 70° E., parallel to the veins, but less frequently strike in a more northerly direction. The 150 South Vein is cut in the east drift by a dyke of porphyry, angling obliquely across the vein in a northeasterly direction.

narrower

The lamprophyre is a reddish, felsitic rock, which, judging by its appearance, is probably related to the porphyry. One prominent shed of lamprophyre has been cut underground in the South drift. It is flat lying, and occupies the back of the drift over much of its length. In the main cross-cut, the lamprophyre forms the back of the drift, and toward the east end it dips gently downward, until, in the east face, it occupies the upper half of the drift. Since it is later than the veins, it complicates development and renders back-sampling unpractical.

The sequence of events is constructed as follows:

6. Porphyry Dykes
5. Lamprophyre dykes
4. Faulting
3. Emplacement of Veins
2. Faulting
1. Diorite intrusion.

Description of Veins

No. 1 Bonus Vein

This vein is a north-dipping vein with a dip of about 40 degrees. It outcrops 125 feet southwest of the shaft, but was not picked up in a long trench just east of the shaft. A vein considered to be No. 1 Bonus Vein was intersected in the shaft at a depth of 50 feet below the collar, and has a reported width of 11 feet, of vein quartz and brecciated, mineralized diorite. Sampling gave results varying from 0.04 to 0.48 ounces per ton, but most samples were below 0.06 ounces per ton.

The north Cross-cut on the 50-foot level should have exposed the Bonus Vein, but did not. A porphyry dyke was intersected at the point where the vein projects and it is possible that the porphyry interrupts the vein at this point.

No. 1 North Vein

No surface outcroppings of this vein were exposed in trenching, but it was intersected in diamond drill holes, which suggest that it may be converging with No.1 South Vein toward surface. The station at 150 feet exposes the vein, which cuts through the shaft about 15 feet below the level. It is a zone of quartz-filled fractures in diorite, and lacks the strong faulting which marks No. 1 South Vein. The walls locally are bounded by slips and clean-cut quartz veins, but more often the vein is a stockwork. The quartz stringers carry a little pyrite but most sulphide mineralization is in the form of coarse cubes and grains of pyrite disseminated throughout the diorite. In the shaft, the vein is exposed for a vertical distance of 15 feet and consists of a fracture zone with quartz stringers, most of which have an almost horizontal attitude. Channel sampling in vertical cuts at 3-foot intervals give an arithmetic average of 0.23 ounces per ton.

Drifting both east and west have exposed No. 1 North Vein for 150 feet. It has a northerly dip of about 40 degrees, and a variable strike, trending slightly south of east. The east end, at the time of examination, was bending toward the south, and approaching No. 1 South Vein. It seems probable that these two veins will converge on strike to the east and upward on dip.

No. 1 South Vein

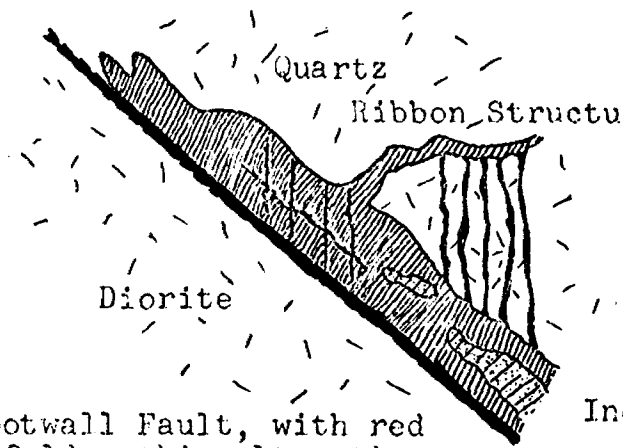
Underground work has been concentrated on this vein, which showed most promise of continuity in drilling and surface work. It strikes N. 70° E., and dips north at about 40 degrees. Drifting has borne out the promise of continuity, and at the

time of examination, the vein had been followed for 500 feet on the 150-foot level. It follows a persistent, well-defined fault, which generally forms the footwall of the vein. Quartz veining crosses the fault at one point, and indicates that the fault is pre-quartz. At the same time, values are concentrated in a narrow band of reddish, feldspathic alteration which follows the fault, indicating that sulphides and gold were in part at least, later than the fault movement. However, the fault is often marked by an open fracture, and pyrite close to it is crushed and powdery white in the centre of the vein zone. It is coarse and cubic, indicating that some sulphides were present prior to the last movement on the fault.

Where No. 1 South Vein is intersected in the cross-cut, south of the shaft, the footwall fault has split into two parts, with the intervening diorite fractured and intersected by a stockwork of quartz stringers. This condition has resulted in an elliptical expansion of ore, which at this point is 20 feet wide normal to the dip. Both footwall and hanging wall are marked by a strong slip carrying an inch or two of red feldspathic alteration. This is bordered on both walls by one to three feet of white quartz characterized by ribbon structure and angular fragments of chloritic wall rock. Ribbons in two directions were observed, one parallel to the vein, and one vertical. The diorite between these veins is highly fractured and mineralized with disseminated pyrite in relatively coarse cubes and grains. This stockwork in the centre of the vein zone carries low values in gold. The white quartz carries a little pyrite, which is concentrated in the ribbons and inclusions, and carries low to moderate gold values. The few

inches of red alteration along the persistent fault, is well mineralized with fine, crushed pyrite, and carries high gold values, often in ounces. Visible gold is not common, but has been observed. Galena is rarely present, and is accompanied by high gold values. A specimen carrying a few specks of galena each with visible gold, was obtained from No. 1 South Vein.

North



No. 1 South Vein - West Wall - Main Cross-Cut South

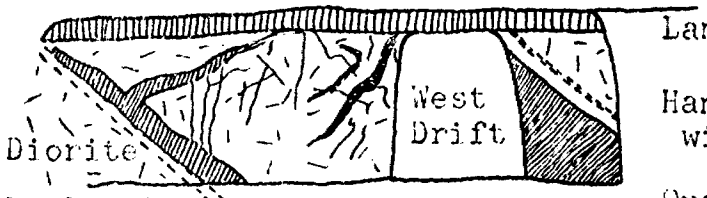
150' Level

Details of Vein Structure on Footwall

West of the cross-cut, the ore zone narrows and for most of its length the width between the two fault fractures is two to three feet. Red alteration marks the walls and the intervening vein is quartz with a little white calcite, and inclusion and ribbons of chloritic wall rock. Sulphide mineralization and values are best where inclusions and ribbons are most numerous. For a length of 85 feet in the west drift, the vein is a barren

White quartz-calcite vein. Values in this section are low and the vein is not of ore grade. In the west face, 285 feet west of the cross-cut, the vein has regained its fragmental, ribboned character, and values have improved.

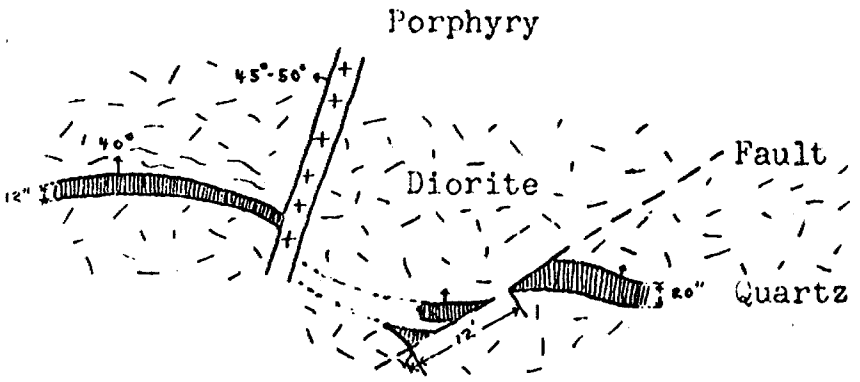
In the east drift, the vein contracts to a single quartz-calcite vein about three inches to thirty-six inches wide, with a fault along one wall only. The fault fracture is characterized by red feldspathic alteration. It lies along the footwall of the vein near the cross-cut, but at a point where the quartz vein narrows to less than six inches, it crosses the pink alteration and fault, which forms the hanging wall of the vein beyond that point. Where the vein crosses the fault, an open slip lined with carbonate cuts the vein but does not displace it.



150' Level - Main Cross-Cut South - West Wall - No. 1 South Vein

Scale 1 in. = 10 ft.

The vein in the east drift is cut by a porphyry dyke, which strikes east of north and dips at 45 to 50 degrees to the west. The vein appears to be faulted along the dyke. The vein is also displaced by a northeasterly striking fault, which moves the vein twelve feet north on the east side.



150' Level - East Drift on No. 1 South Vein

A flat lying sheet of lamprophyre forms the back throughout most of the east drift, occupying the upper half of the east face (April 4, 1950). This renders back sampling impracticable.

No. 5 Vein

One hundred and seventy feet north of the shaft, a sheared, fractured zone striking south of east, and dipping north, was encountered in the main cross-cut. This zone is made up of several closely spaced, weak fractures, with little quartz. The intervening diorite is well mineralized with disseminated pyrite, and several specimens containing visible gold in small quantities were seen. This zone was not predicted by surface drilling. Only one round had been taken on it, east of the cross-cut, at the time of examination.

Wall Rock Alteration

Diorite is the only pre-ore wall rock. It is fine textured and somewhat chloritic near the veins. Inclusions and ribbons of diorite show various stages of silicification, from chloritic diorite cut by a few stringers of quartz, to greenish quartz with

a few remaining patches of chloritic material.

Carbonatization was not observed in the vein walls.

The reddish feldspathic material which occupies the fault along the footwall of No.1 South Vein appears to be of hydrothermal origin, but it has clean cut contacts, and its effect on the walls is not noticeable.

Sulphide Mineralization

Pyrite is the predominent sulphide, but arsenopyrite is present in small amount. Sphalerite and galena have also been observed, the latter being an indicator of gold values.

Ore-Bodies and Sampling Procedure

Channel sampling of the walls and backs has been carried out on all the veins, but at the time of examination, no plan had been drawn up showing the vein in relation to the samples. Samples are recorded on a card index system, and this has been used in estimating grade and ore reserves. The estimation of grade is an arithmetic average, which omits some samples of vein material which do not carry values. Muck samples have been lower than grade estimated from channel samples. High erratic values have been rather severely cut by the method, outlined in the following example:

	No. of Samples	Average Width	Feet x Ounces	Average Grade
(1) Uncut Average	50	5'	125	0.5 oz./ton
(2) High Erratics	1	6'	12	2.0
(3) Corrected Assay		6'	9.0	2.0-0.5 = 1.5 oz./ton
(4) Corrected Average	50	5'	125-9 = 116	$\frac{116}{250}$ = 0.46 oz./ton

On this basis, the following ore-sections have been worked out on the 150-foot level.

150 South Vein - (1) 191 feet of 0.434 uncut or 0.36 cut over 4.5 feet
(2) 88½ feet of 0.30 uncut or 0.27 cut over 3.66 feet
The east end, where the lamprophyre occupies the upper half of the drift, is not included.

150 North Vein - (a) 46 feet of 0.30 cut over 6.25 feet.
(b) 36 feet of 0.34 cut over 6.5 feet.

Two independant companies which sampled the 150 South Vein estimated an average width of 2.7 feet and 3.0 feet, and a grade slightly in excess of 0.30 ounces.

Nelson Hogg,
Resident Geologist.

Timmins, Ontario.
May 10, 1950

OROFINO GOLD MINES LTD.
Silk & Norwood Townships

Examination of surface and diamond drill core.

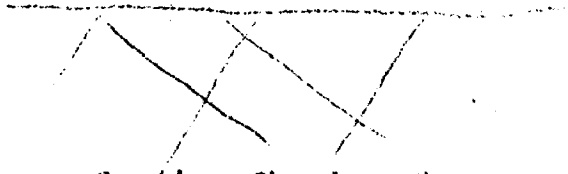
Drilling on the property has been largely confined to the diorite, and this area has also been stripped to some extent, although it has not been delimited either on surface or by drilling. The country is covered with sandy clay and boulders, and a very close growth of brush which makes surface work very difficult.

However, trenching has disclosed a considerable number of mineralized zones, which may be isolated lenses or may be connected in some irregular pattern. The amount of exposure is not sufficient to give a picture of the occurrence. It does show that the quartz lenses pinch and swell and are contorted a great deal, with a large number of more or less parallel stringers making up the zone. The mineralization is not in the quartz, though quartz is always present in glassy stringers as described above. The mineralization is in the diorite, which, in these zones of mineralization, becomes dark green and chloritic, with the feldspars very obscure, and the ferromagnesians drawn out. Mineralization consists almost exclusively of pyrite, in grains and cubes up to 1/8 inch in diameter and nearly all of medium size. There are also local aggregates of grains.

Where the diorite is not close to the ore, it is of intermediate texture and often diabasic. The laths of feldspar are very prominent locally, but for the most part while the feldspar stand out, they are of more rounded form. In no place was a true granitic texture noted.

The mineralized zones have been grouped into veins No. 1, No. 1 Bonus, No. 2, No. 3, No. 3 Bonus, and others but this grouping is by no means proven. Surface trenches are often more than 100 feet apart, and on a single exposure the zone will pinch and swell and change strike considerably. Drilling has been carried out at 50 foot intervals, but here again the intersections are difficult to correlate.

Cam Brown has worked out a series of veins striking roughly N50°E, and with dips ranging from 30°North to 30°South, making up a network of complimentary dipping fracture zones.



Cross-Section Showing Theory of Vein Pattern

The dip is calculated from the dip of quartz stringers and fractures within the mineralized zones. However, thereseems to be a good chance that these run obliquely across the zone and may not represent the true dip.

The ore exposed on surface and in drilling is clearly defined by pyrite mineralization and if it has any continuity should make good ore-bodies over mineable widths. Pyrite may make up over 50% of the rock, but 10-15% seems to be more general in sections that make ore grade. In the drilling it is noteable that a certain amount of red orthoclase wall alteration accompanies the ore in some places. This does not show up in the trenches.

In several places trenches have been excavated in mineralized zones where, the wall rock is quite fine textured, but dark and chloritic. These are considered by Cam Brown to represent roof pendants of greenstone, because in drilling under them, good diorite was encountered. While these fine-textured rocks are well mineralized and have quartz-stringers similar to the ore-zones, they do not carry values.

The diorite and the ore is intruded by a series of acid and basic dykes. Acid dykes include good feldspar porphyry with well developed white plagioclase phenocrysts. These dykes are known up to width of 15 or 20 feet. While they apparently intrude the ore, and dip more steeply than it (almost vertically), there is no conclusive evidence of age relationship. They are massive fresh, and little fractured and they are not cut by quartz stringers nor are they mineralized. However, phenocrysts are found with no change in size right up to sharp contacts with the diorite. The porphyry dykes strike more or less parallel to the ore.

The porphyry, diorite, and ore, are also cut by miscellaneous narrow lamprophyre dykes, including grey, acid dykes, dark fine-textured basic dykes and grey to reddish biotite lamprophyre. The biotite types, known locally as hornblende biotite, porphyry, are often well mineralized with fine, disseminated pyrite, which is barren.

Timmins, Ontario,
August 26, 1947.

Resident Geologist.