THE SUNSHINE LARDEAU MINE

An essay submitted during the Third Year of the Course in Applied Science at the University of British Columbia.

D.A. Davidson,

November 1, 1955

FACULTIES OF APPLIED SCIENCE AND FORESTRY

University of British Columbia.

1265 West 13 th Avenue
Vancouver,
British Columbia
November 1, 1955

Dr. H. C. Gunning,
Faculty of Applied Science,
University of British Columbia,
Vancouver, British Columbia.

Dear Sir;

I submit the enclosed essay, " The Sunshine Lardeau Mine ", in partial fulfillment of the Course in Third Year Applied Science at the University of British Columbia.

Yours truly,

D.A. Davidson

D.A. Davidson.

CONTENTS

Page

Introduction.....1

Location.....1

History of the Sunshine Lardeau Mine..2

Geology of the Ore Zone.....8

Mining at Sunshine Lardeau.....9

Milling.....11

Refining.....15

Conclusions.....17

References.....18

Appendix I. Composite Level Plan

ILLUSTRATIONS

Page

Fig.1. Map Showing Location of Sunshine Lardeau Mine.....2

Fig.2. Map of Mine to Mill Road and Claim Map.....3

Fig.3. Production Record of the Spider Mine.....7

Fig.4. Ore Truck at the No.10 Portal.....10

Fig.5. Ore Truck at the Mill Raise.....12

Fig.6. The Mill Building.....14

Fig.7. Mill Flow Sheet.....16

PREFACE

abbreviations are a little out of place in a formal preface

The material in the following essay was obtained in the summer of 1955 during a one-month examination of the Sunshine Lardeau Mine by the B.C. Dept. of Mines. B.C. Dept. of Mine reports were consulted for the history of the mine.

what was your connection?

November 1, 1955

D. A. Davidson

D. A. Davidson.

THE SUNSHINE LARDEAU MINE

Introduction

The purpose of this essay is to familiarize the reader with the Sunshine Lardeau Mine. Operations are discussed in some detail, and the highlights of the development of the property over the years are also given.

Location

The Sunshine Lardeau Mine is located near Cambourne B.C., which is approximately 30 miles southeast of Revelstoke, B.C.

The mill, bunkhouses, cook-house and office buildings are situated in the town of Cambourne.

The workings are located 1 mile east of Cambourne at an elevation in the order of 3000 feet above sea-level. The operations are at present confined to the Eclipse, Spider and

Spider No. 1 mineral claims; (see fig. 2). A rough winding road about 1½ miles long leads from Cambourne to the mine. Access to this locality is made through Beaton, B.C., 5 miles to the southwest.

History of the Sunshine Lardeau Mine

By 1889 several claims had been worked on the upper reaches of the Incomapleux River, but it was not until 1894 that claims were staked close to Poole Creek. In 1899 good

Fig.1. Map Showing Location of Sunshine Lardeau Mine

gold values were obtained from the Eva Mine on Poole Creek, and a gold rush ensued. However, the operation proved unprofitable and activity was discontinued.

The Spider and Eclipse claims were staked as early as 1908, and by 1910 a 50 foot tunnel (No. 1 level), had been driven following an 18 inch vein of galena. Small shipments were made in 1911 and 1912 which had very high silver values. By 1914, a new tunnel (No. 2 level) had been driven for 150 feet. Two hundred and fifty feet of tunnel had also been driven in the Eclipse workings, following quartz veins with a width of 6 to 8 feet.

Operations were continued on a small scale and in 1917 the Multiplex Mining, Milling and Power Company acquired control of 18 claims extending from the valley of Poole Creek southeast to the summit of the ridge. The block of claims included the Spider and Eclipse mineral claims. The third level was started and then operations ceased entirely for 3 years.

In 1921 development work started and this continued intermittently for several years. During this time, level No. 4 and No. 5 were started. The ore was being found in small spotty bunches and so operations were reduced to a minimum. In 1926, 1927, and 1929 more small shipments were made. Levels No. 6 and No. 7 were started in this period. Two parallel vein zones were now exposed. The eastern vein was explored by levels 1 to 4, and the western vein zone was

developed by levels 5 and 6. Preparations had been made for drilling the adjacent Eclipse claim which had been developed by open cuts and a 250 foot adit.

Once more operations ceased entirely , and in 1936 the Multiplex Mining, Milling and Power Company sold their claims and control was transferred to the Spider Gold and Silver Mines Ltd. Operations were again resumed on a small scale, and in 1937 another small shipment was made. An agreement was made with the Meridian Mine to use their mill on a co-operative basis.

Little work was done from 1938 to 1949; but, in 1941 a small shipment of ore was made. In 1949 a shipment was made from levels No. 2, No. 3 and No. 5, and preparations were made for exploration work. Two thousand feet of Diamond drilling was carried out in levels No. 4 and No. 5 in 1950. An additional 1000 feet of drilling was done on the surface. A crosscut on level No. 5 was started to investigate the results of the diamond drilling. In 1951 this crosscut was completed and 25 feet of lead-zinc mineralization were found after drifting 115 feet. Level No. 6 was pushed through to intersect this ore body.

The Dentonia mill had been purchased and the equipment was set up in the old Meridian mill building. The mill raise was built to eliminate the steep grade on the first part of the road. By the end of 1952 the mill

was treating 1700 tons a month.

Operations were concentrated on the western vein zone, which was being further developed by levels 5, 6, and 8. The exploration work consisted of a 325-foot crosscut driven from level No. 5 across to the eastern vein zone as well as 725 feet of diamond drilling.

In 1953, the main development was the driving of a level No. 10. The western vein zone was encountered 540 feet from the portal. Five hundred and sixty feet of drifting was done along the western vein which was about drift width. On the level No. 8, drifting on the vein exposed an ore shoot about 350 feet long. A raise was driven from level No. 8 to level No. 6, and a sublevel No. 7 was established. The ore produced came chiefly from stopes on level No. 8 and developed headings. Some oxidized high-grade ore was obtained from the old workings on level No. 6. Production varied from 550 to 2000 tons per month (this variation was partly due to difficulties in maintaining transportation of ore to the mill because of road conditions).

In 1954 an option was taken on the Eclipse mineral claim. Four surface drill holes located the southerly extension of the vein in this optioned claim. A sublevel was driven on the vein midway between No. 8 and No. 10 levels and exposed an ore shoot 195 feet long and 4.8 feet wide. Drifting on No. 10 level in the Eclipse claim

disclosed 2 short ore shoots; one, 61 feet by 2.3 feet and the other, 23 feet by 3.0 feet. Early in 1955 the Eclipse vein drift disclosed an ore chute 182 feet long and 3 feet wide.

Year	Tons Shipped	Au. (oz.)	Ag. (oz.)	Pb. (lb.)	Zn. (lb.)
1911	6	--	1,051	4,153	----
1912	12	16	9,909	4137	----
1917	6	--	307	1,633	----
1926	137	8	9,314	35,786	32,260
1927	28	1	1,863	8,652	7,687
1929	6	--	470	2,434	----
1937	90	8	6,784	34,019	29,838
1941	12	1	1,294	8,132	3,122
1949	26	3	942	9,839	7,028
1950	Non Producing				
1951	Non Producing				
1952	Crude Ore 800 tons Pb.Concentrate 692 tons Zn.Concentrate 581 tons	706	147,710	1,298,777	836,525
1953	Pb.Concentrate 1,793 tons	1,103	154,658	2,221,558	2478730
1954	Crude Ore 800 tons Pb.Concentrate 2,546 tons Zn.Concentrate 2,767 tons				

Fig. 3 Production Record of Spider Mine

Geology of the Ore Zone

The ore deposits occur in the "Central Mineral Belt", one of three distinct mineralized zones in the Lardeau area, that follow the strike of the sediments. The veins are narrow masses parallel to the strike and apparently were formed along fissures and shear zones.

In the Spider and Spider No. 1 claims, the two parallel vein zones and underground workings are in a band of schistose green grit which strikes about 310° and dips 70° to 80° northeast. The numerous drag-folds suggest that this green formation is intensely folded. Within the schistose green grit are irregular zones of carbonate alteration, some of which appear to lie parallel to the foliation while others cut across it and seem to relate to fractures.

The veins chiefly occupy northerly striking fractures dipping 60° to the east. Fracturing is quite extensive but there is no indication of appreciable movement.

The ore occurs along bedding and fracture planes and as bunches at their intersections. It consists of iron, zinc, and course-grained lead sulphides, in irregular masses and stringers. There are fair silver values (which seem to decrease with depth), and a trace of gold in these sulphides. Gangue materials consist chiefly of quartz, with the occasional presence of calcite or other carbonate.

Mining at Sunshine Lardeau

At the Sunshine Lardeau Mine, there are two 8 hour shifts a day in the workings; each shift mucking, drilling and blasting in that order.

The mucking is done with pneumatically operated slushers which bring the broken ore to the grizzlies at the ore chutes. Ore or waste in the haulage levels is loaded into the mine cars with mechanical loaders. A compressed air locomotive hauls the ore and waste out of the main haulage levels to the compressor building where the waste is dumped down the steep slope of Poole Creek valley, while the ore is dumped onto the grizzles above the coarse ore storage bins. There are two compressor buildings located at levels No.8 and No.10. They each contain two Gardener-Denver compressors, and houses a machine shop and a blacksmith shop.

Most of the drilling is done with jack-leg drills, but in a few of the narrow inclined stopes, stoper-drills are used. All drills are pneumatically operated. One and three-quarter inch throw-away bits on seven-eighth-inch hexagonal drill steel are used in drilling most of the holes. The holes are generally not drilled perpendicular to the face, but are drilled at some angle in order to take advantage of some characteristic of the rock or of the type of explosive that will give a more economical blast. The holes are drilled to a depth of six feet. Thermalite fuse is used to fire the charge when

you have been using figures not words all along.

the drill holes have been loaded.

In most of the stopes at the mine, shrinkage stoping is the method used to remove the ore. The greater part of the ore is left in the stope to afford a floor on which the miners can stand while drilling the back. About one-third of the ore must be removed, as the broken ore occupies a greater volume than the original solid mass. The remaining two-thirds of the ore that is used as a floor is removed when the stope is mined out. In this type of stope, mining proceeds upward from the bottom.

Some shrinkage stopes are made by driving several raises from a level, through a sufficient thickness of ore to make pillars. The tops of these raises are then connected to form the bottom of the stope, while the raises themselves can

Fig.4. Ore Truck at the No.10 Portal

be used as manways or ore chutes. When the stope has been mined out, the pillars can be removed.

In one narrow inclined vein on the eighth level, stulled stoping is the method used to remove the ore. A single timber post or stull is set in place by digging a small hole to give a firm footing for one end of the stull. The other end of the stull is then wedged against the opposite wall. Stulls are not placed perpendicular to the dip of the walls, but at a small angle above the perpendicular. This aids in the wedging effect.

After a row of stulls have been set in place, a headboard is placed on top of the stulls from which the drilling, loading and wiring is done. The head board is removed before blasting. A new series of stulls are then put in place a little higher up, and the procedure is repeated.

In the old workings on levels No.5 and No.6, some high-grading is being carried out by a small shift.

Milling

From the coarse ore storage bins at levels No.8 and No.10, the ore is hauled by truck over 1½ miles of rough, narrow, winding road to the mill raise.

Crushing

The grizzly at the mill raise consists of heavy parallel iron bars; the ore is hammered through giving a -9-inch product. From the mill raise, the ore is hand-trammed about 200

feet to the mill. The ore is dumped onto the sorting belt where the waste is discarded in a hand picking operation. The sorting belt discharges the ore onto a scalping screen where the -1- inch products are diverted to the fine ore bin. Plus one-inch products are carried from the scalping screen by a conveyor to the jaw crusher(Denver 9" by 16"), where the ore is crushed to a -1½-inch product. This product then goes to the fine ore bin.

Perhaps you should write out the "minus"

Fig.5. Ore Truck at the Mill Raise

Grinding

A fine ore feeder carries the ore from the fine ore bin to the ball mill(Denver 5' by 5' overflow type). The ball mill has a rated capacity of 30 tons a day, but at present 90 tons a day are being put through it. Lime, xanthate Z-3, cyanide and zinc sulphate are added to the pulp as it leaves the ball mill.

Floatation and Filtration

The pulp now enters a unit cell where an estimated 75% of the fine lead is taken out and pumped by a SRL pump to the lead thickener. The remainder passes into a spiral classifier where the rest of the fines overflow and are pumped by a SRL pump to the lead floatation cells. The sands or coarser particles go back to the ball mill.

Before the pulp enters the lead floatation unit, it is treated with several substances which aid in the separation of the lead and the zinc. These are:

1) Frothers: Dowfroth forms a layer of froth on the surface of the pulp which prevents the bubbles from breaking when they reach the surface.

2) Collectors: the collectors added to the pulp are the xanthates Z-3 and Z-5. The xanthates and the lead sulphides ionize and an insoluble lead-xanthate is formed, which has a water repellant surface and so "floats".

3) Depressing agents: these prevent the collector molecules from attaching themselves to a mineral surface and thus inhibits floatation of the mineral. Cyanide is added to depress the zinc sulphide so that it remains in the tailings from the lead cells. CaO is also added which is a depressing agent for pyrite as well as a conditioning agent to maintain the proper pH of the pulp.

4) Activating agents: the tailings from the lead cells are treated by the addition of copper sulphate which is an activating agent for the ZnS. In the presence of more xanthate the ZnS becomes floatable and can be collected as a zinc concentrate.

The treated pulp flows into the lead floatation unit which consists of six No.15 Denver lead cells. The first three cells are the cleaner cells, and from these a finished product can be sent to the lead thickener. The concentrate from the three rougher cells enters the first cell, while the low-grade or finished tailings pass into the zinc conditioner where the

Fig.6. The Mill Building

activator for the ZnS, copper sulphate and more xanthate collector are added.

At this point there is a sampling box from which samples can be taken periodically to determine the amount of lead that is going out in the tailings. If there is an excess of lead in the tails, the floatation cells can be adjusted to correct this.

After conditioning, the zinc pulp enters the zinc floatation unit which contains 14 cells. The first two cells (No.15 Denver), are the cleaner cells, and from these a finished product is sent to the zinc thickener. The remaining cells, six roughers(No.15 Denver) and six scavengers(No.18 Sp. Denver), send a rough concentrate back to the first cleaner cell. The residue passes out over a pilot table to the tailing trough. The pilot table indicates the amount of zinc going out in the tails, and the floatation cells can be adjusted accordingly.

The lead and the zinc concentrates proceed from their respective thickeners to their individual filters. The lead filter is a 4 foot, 3 leaf Denver model and the zinc filter is a 4 foot, 2 leaf Denver model. The dried concentrates are dumped from the filters into their respective bins, and the liquid residue is sent out with the tailings.

Refining

The concentrates are carried 6 miles from Cambourne to Beaton by large International trucks which are equipped

with detachable boxes. The loaded boxes are removed on the concentrate barge and the trucks return to Cambourne with an empty box to get another load. Once loaded, the barge sails from Beaton, through the Upper Arrow Lakes to Nakusp, B.C., some 40 miles away. Here, the barge is docked and the concentrates are trucked 250 miles to Kellogg, Idaho for refining.

Conclusions

The properties presently controlled by the Sunshine Lardeau Mines Ltd. had not been reasonably developed until the last few years. Failure of the small companies who had worked the properties previously, was undoubtedly due to the lack of sufficient exploration work. At present there are 50,000 tons of ore in reserve, and the operation should be a profitable one unless something unforseen happens to the lead-zinc market.

Transportation of ore from the mine to the mill will remain the major problem unless ore reserves can be developed to a level that will justify constuction of a new road.

REFERENCES

Memoir 161 of the Geological Survey of Canada

Memoir 2 (1914) of the B.C. Dept. of Mines

B.C. Dept. of Mines Reports; 1898 to 1954

Mat 18/25
Pres 20/35
Eng 25/40
63 %

$\frac{63}{100} = \frac{25}{40}$

Generally speaking, this is a fairly competent piece of writing. Material is suitably organized, and form and layout are for the most part in accordance with instructions.

Your errors in writing are mostly mechanical: hyphenation is usually lacking or faulty; punctuation is careless (continual misuse of semicolon); spelling is somewhat careless.