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**REPORT
ON**

FORD IRON PROPERTY
GRADE, TONNAGE AND
COSTS ESTIMATES

ZEBALLOS, B. C.

MINING DIVISION

Chas. M. Campbell, Jr.

No date found

DIAMOND DRILLING AT ZEBALLOS IRON

1951 to 1952

<u>Section No.</u>	<u>Hole No.</u>	<u>Latitude (N)</u>	<u>Departure (E)</u>	<u>Elev. (feet)</u>	<u>Bearing</u>	<u>Angle</u>	<u>Depth</u>	<u>Core Size</u>
64	3	7100	3812	2810	N71E	-70°	859	Ex
38	4	6420	4095	2353	N15W	0°	121	Ex
57	5	6855	3754	2662	N67½E	-65°	664	Ex
62	6	6982	3750	2729	N70E	-55°	830	Ex
56	7	6871	3921	2673	N60E	-63°	575	Ex
52	8	6783	3968	2626	N60E	-63°	435	Ex
52	9	6783	3968	2626		-90°	270	Ex
43	10	6627	3958	2556	N78E	-58°	637	Ex
47	11	6625	3958	2556	N51E	-56°	426	Ex

TOTAL 4817 Ex

63	101	7169	4238	2475	N76E	0°	141	X-ray
63	102	7169	4238	2475	S85W	0°	113	X-ray
61	103	7120	4244	2470	W	0°	127	X-ray
58	104	7066	4278	2425	N81W	+15°	55	X-ray
59	104A	7066	4278	2425	N76W	+15°	113	X-ray
59	104B	7066	4278	2425	N71W	+15°	170	X-ray
56	105	7032	4261	2464	S71W	0°	121	X-ray
55	106	6997	4298	2432	S68W	0°	156	X-ray
52	107	6958	4307	2410	S63W	0°	237	X-ray
47	108	6846	4376	2384	S60W	0°	207	X-ray
45	109	6706	4272	2376	W	0°	251	X-ray
45	110	6632	4302	2384	N50W	0°	197	X-ray
40	111	6667	4479	2293	S70W	0°	227	X-ray
38	120	6632	4302	2384	S50E	-60°	198	X-ray

by Ford Iron Syndicate (1939)

53	1	7059	4377	2320	S50W	-30° ⁺	252	X-ray
57	2	7117	4330	2360	S62W	-10°	300	X-ray

TOTAL 2865 X-ray

Total Diamond Drilling 7682 feet

REPORT

ON

FORD IRON PROPERTY

ZEBALLOS, B. C.

GRADE, TONNAGE AND COST ESTIMATES

INTRODUCTION:

This report includes ore reserve and ore grade calculations, general estimates of probable operating costs, of probable capital expenditures required to bring the property into production, and all available pertinent information in connection with the Ford Iron Deposit.

Estimates of costs and expenditures are based on the Western Canada Steel Limited requirement of 300 tons per day 365 days per year.

They are also based on the probability that logging operations of the Tahsis Company in the Zeballos Valley will be suspended this fall. As a result, the logging road, the foreshore rights at the head of Zeballos Arm, and possibly certain facilities, will be available.

ORE GRADE:

To determine ore grade, a weighted average was taken of all drill holes in ore. This shows 56.5% Fe. Of the drill core approximately 5% represents bands a foot or more in width of barren material, and 5% low grade material ranging up to 21% Fe. Elimination of all of this would raise the grade to 63%.

It is probable that in mining there will be dilution of about 5%. If this dilution and the barren material are elim-

inated in a concentrating process, the grade of the product is 60%.

It appears, therefore, that a product of from 57% to 60% iron will not be difficult of attainment. The installation of equipment to take off and concentrate a middling product would further increase this grade.

The grade calculations follow -

<u>D.D.M.</u> <u>No.</u>	<u>TOTAL</u> <u>WIDTH</u>	<u>% Fe</u>	<u>% Fe x Width</u>
101	89.5	57.6	5,140
102	78.0	56.7	4,427
103	72.5	49.5	3,592
104B	80.0	56.5	4,491
105	78.5	59.0	4,642
106	106.0	61.5	6,525
107)	54.5	65.0	3,547
	83.6	63.5	5,408
108	15.0	57.8	867
109	65.0	53.2	3,495
111	91.0	55.5	5,047
8	91.0	49.4	4,496
7	102.5	52.1	5,337
11	<u>61.0</u>	<u>52.1</u>	<u>3,164</u>
	1067.5	54.5	60,378
Add 5% Dilution	<u>53.4</u>		
	1120.9	54.0	60,378
Sort 10% Waste	<u>112.1</u>		
	1008.8	60.0	60,378

TONNAGE ESTIMATE:TONNAGE FACTOR CALCULATION:

S.G. Magnetite	5.18	(72.4% Fe)
S.G. waste	say 2.7	
Assume	x lbs. magnetite per ton of 56.5% material	
	$\frac{72.4}{100} \times = \frac{56.5}{100}$	(2000)
	$x = \frac{56.5}{72.4}$	(2000)
		= 1560 lbs.
Volume Magnetite =	$\frac{1560}{62.5 (5.18)}$	= 4.8 cu.ft.
Volume Waste =	$\frac{440}{62.5 (2.7)}$	= 2.6 " "
Tonnage Factor		= 7.4 cu.ft. per ton of ore in place.

The principal body of ore now available for mining extends from Section 51 to Section 65 (see longitudinal projection) or a length of 340'. If it extends down to the 2200' elevation from Section 51 to 56, as shown, it has an average height along the slope of 235' and an average width (from sections) of 70'. This indicated tonnage is therefore -

$$\frac{70 \times 235 \times 340}{7.4} = 750,000 \text{ tons}$$

What form the two orebodies to the south will take is not entirely clear, but indications are that they will provide at least an additional 200,000 tons

		<u>200,000 tons</u>
	Total indicated ore	950,000 tons
<u>LESS:</u>	Dyke and other non-recoverable pillars	10% <u>95,000</u>
		855,000 tons
<u>LESS:</u>	Waste Rejects	5% <u>42,750</u>
	indicated ore available for shipment	812,250 tons

On a basis of 110,000 tons per year, this will last 7-1/2 years.

In addition, outcrops north of Section 65 and Black-sand Creek, which have similar dimensions on surface, may be expected to produce a similar tonnage. Depth possibilities must also be determined.

Diamond drill holes 3, 5 and 6, which were barren, make it necessary for purposes of ore reserve estimates, to cut off the indicated ore as shown on the longitudinal projection. The strength of the outcrops to the north are good reason to question this condition. The possibility that the limestone footwall reverses its dip, and therefore that these holes missed the orebody, must be considered.

MINE DEVELOPMENT:

LOCATION MAIN HAULAGE:

With the information available, the location of the bottom of the orebody cannot be predicted, but the strength of the intersections in D. D. holes 7, 8, 11 and 111, all at or below 2300' elevation, suggest its persistence at least to 2200' elevation.

On surface just below this elevation the campsite, shown on Map 23, covers an area which could be levelled, with development waste, into a suitable yard, and provide adequate space for the mine surface plant.

The main haulage level should, therefore, be driven at approximately this elevation, as shown on the longitudinal projection.

MINING METHOD:

The deposit will likely be mined by a system of diamond drill blast holes, shrinkage stoping or benching, or a combination of these. Ore will be handled at the haulage level through mucking machine draw points, or from ore passes fed by secondary blasting chambers. The nature of this layout will depend on the nature of the ore zone at the main haulage horizon, and on whether or not it persists below that horizon.

In any case, at least one intermediate level 550' long (shown on the longitudinal section), several hundred feet of crosscutting and four through raises, having a total length of 1200 feet, will be required in the mining operation. Of this the main haulage level, 350' of other lateral work and 600' of raising, together with 600' of draw raises, certain stope preparation and diamond drilling, should be completed in advance of full scale production.

In order to reduce secondary breaking charges, the capital cost estimates are based on large cars and loading equipment, capable of handling large material to be fed into a 24 x 36 crusher.

SUBSEQUENT DEVELOPMENT:

Following this, the completion of this development work, and the development of further ore, especially north of Blacksand Creek, will require some diamond drilling, and 1500' of development work per year. This will cost approximately fifty cents per ton mined.

THE INCLINE:

Ore will be transferred from bins at the 2200 main haulage level to bins at the bottom of the hill by in-

clined tram operating on 3 rails, with a passing truck half way up. An approximate location for this is shown on the geological sheet 28.

The incline will be approximately 3500' long and will average 28° on the slope.

A similar installation was required at the Mastodon Mine near Revelstoke, under somewhat more difficult, though not entirely incomparable conditions. This is described by Mr. A. S. Pike, Mine Manager, in a letter as follows:

"We had to go up in a heavily timbered area where there were numerous steep rock bluffs. We logged off the right-of-way only wide enough for the incline as we had to leave the timber alongside to prevent snowslides. We then blasted off most of the humps and made numerous rock cuts to ease the vertical curves. Where possible, the ground was graded and ties laid on the ground. On grade changes and over rock, wooden trestles were built.

The total cost of this work, not including the hoist, skips, ropes and rails, was about \$40,000."

The length of the Mastodon incline is 2450', and it has an average slope of 37°. This gives a cost per foot for that job of \$17.

BRANCH ROADS AND YARD:

From the present logging road in the Valley, a branch road about a mile long to the bottom of the incline, and a yard area at that point are required. The accepted cost for this type of road in this country is \$8.00 per lineal foot. Since the location has already been logged, and since it is largely gravel, this cost should be much lower, and it is estimated at \$20,000.

LOCATION OF CRUSHING AND CONCENTRATING PLANT:

This will be located at either the top or the bottom terminal of the incline. If at the top, where there appears to be adequate space, the nature of the topography will facilitate disposal of rejected waste, the crushed final product will be more easily handled on the skip, and the consolidation there of principal operations will facilitate supervision. If, however, a large tonnage of magnetite is found to exist below the proposed main haulage level, it will have an important bearing on this decision.

DEGREE OF CONCENTRATION:

The estimates which follow allow for a large crushing unit to produce a product of about 2 inches diameter. This will be passed over a strongly magnetic head pulley where barren material will be eliminated.

It may be found desirable to take off a middling product representing 10-20% of the feed. This would pass through a secondary crusher preliminary to further magnetic separation treatment. This stage, which would not require a heavy capital expenditure, is not included in the estimate. It may or may not be necessary.

LOCATION OF COMPRESSORS AND PUMPS UNIT:

The diesel electric power unit will be located at the base of the incline to which point fuel oil can be conveniently hauled.

The Standard Oil Company have an agency at Leballes. Their office in Vancouver advise that they will supply storage

tanks and deliver oil to them, but that the installation will be for the company account.

The Compressors will be located in the hoist room at the top terminal, where the hoist men will be charged with their operation.

STOCK PILE - LOADING & WHARFAGE FACILITIES:

Freight will be handled at the Government wharf, which is equipped with a freight shed adequate for ordinary requirements.

Canadian Pacific Coast Steamship freight rates, including handling and wharfage charges, Vancouver to Leballos, amount to about \$20.00 per ton for general machinery, and \$56.00 per ton for tractors and trucks.

Ore will be stock-piled on Lot 501 (see map in pocket). Loading equipment required and its cost have been outlined in a new proposal by Stephens-Adamson Mfg. Co. of Canada Ltd.

New wharfage will be required at this point. A structure 50' long by 25' deep will be adequate. In addition, four or five dolphins in line will be required. Cost of this type of installation is estimated by the Public Works Department at \$8.00 per square foot. Being small, this will entail a higher unit cost.

The stockpile area will require an additional 2500 yards of gravel fill.

Power to operate the loading equipment will likely be available from the plant serving the Leballos Community.

This plant is owned by the Tahsis Company, and would be involved in negotiations with them for use of their facilities.

MINE WATER SUPPLY:

Mine water will be drawn from Pandora Creek or its tributaries. This has not been examined in detail, but a six inch wood stave pipe 5000' long, and a 20,000 or 30,000 gallon tank are indicated.

WESTERN CANADA STEEL LIMITED REQUIREMENTS:

Mr. G. R. Heffernan advised that their requirements will be 300 tons per day, 365 days per year. This amounts to -

109,500 tons per year
9,125 tons per month
2,100 tons per week

Mr. Heffernan suggests a possible furnace charge of 50% coarse and 50% fine material. The coarse to range from 1/2 to 1-1/2" and the fine to have the following screen analysis:

1%	on	3/4"
9%	3/4"	to 1/2"
21%	1/2"	to 3/8"
40%	3/8"	to 1/4"
21%	1/4"	to 3/16"
9%	Under	3/16"

This does not indicate a problem with fines with this ore.

WATER TRANSPORTATION FROM ZEPHALOS:

Transportation of ore was discussed with Mr. Sollo-way, Mr. N. A. Benson and Capt. F. Talbot, Marine Superintendent of Frank Waterhouse & Co. of Canada. They were asked for, and agreed to provide, an estimate of ore transportation costs. So far this has not been forthcoming. My assumption is that their equipment is all in use.

Their barges have a length of 260', 240' and 210' and handle 1650 to 1800 tons. They have a freeboard of 2'6" loaded, and 10'6" unloaded, and have an average draught of 16'. Their tug, the Veta C, would move barges at about 8 knots.

The distance is approximately 350 knots. Thus, allowing for loading and unloading and delays, a round trip per week is indicated.

New Westminster Harbour Commissioner Office advise that the Fraser River North Arm Channel at low tide is 15 feet from deep water to the Marpole Bridge, and 10 feet above the bridge. The Vancouver Steel Co. plant is two miles above the bridge.

With further industrialization, it is conceivable that this channel will ultimately be dredged. Mr. Befferman has no details.

Ore would be brought in on barges at high tide and allowed to rest on a "bed" during unloading operations.

The possibility of a self-unloading barge was discussed and eliminated, since handling equipment for scrap and for loading steel products will be necessary at the Steel Plant.

This whole matter, therefore, requires further investigation. Arrangements will have to be made with one or other of the shipping companies to handle this shipment on a continuous operation basis. The nature of the shipping equipment will affect in some degree the final design of the loading facilities.