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- R E P O R T -

MANGANESE ORE DEPOSITS.

COWICHAN AND DUNSMUIR DISTRICTS.

VANCOUVER ISLAND,

BRITISH COLUMBIA.

September 9th, 1918.

G. D. B. TURNER  
MINING ENGINEER  
6 CHURCH STREET  
NEW YORK

92C 139

92B 027

G. D. B. TURNER  
MINING ENGINEER  
6 CHURCH STREET  
NEW YORK  
—  
TELEPHONE, CORTLAND 2793

BRANCH OFFICE  
BUTTE, MONTANA  
316 DALY BANK BUILDING

Mt. Edwards Apts.,  
Victoria, B. C.,  
Sept. 9th, 1918.

C. H. Dickie, Esq.,  
Victoria, B. C.

Dear Sir:

I am pleased to submit a preliminary report on the Cowichan manganese ore deposits under consideration.

The manganese ore deposits recently discovered on Vancouver Island are situated in the Districts of Cowichan Lake and Dunsmuir, near the summit of the divide between the Chemainus and Cowichan Rivers, along a belt of country about 22 miles in length extending from a point about 7 miles North East of the lower end of Cowichan Lake to a point 7 miles north of the upper end of the lake. Along this belt three large deposits of manganese ore have been located as follows:

(a) The first, known as Hill 60 at an elevation of 2700 feet above sea level, is four miles East of the little town of Lake Cowichan and one mile distant North from a branch of the Canadian Pacific and Canada Northern Railways.

(b) The second deposit known as the Cottonwood area, lies about 12 miles North Westerly from Hill 60,

near the head waters of Cottonwood Creek, which flows southerly into Cowichan Lake.

(c) The third deposit known as the Black Prince Group, at an elevation of 1850 feet above sea level is 10 miles beyond the Cottonwood area or 22 miles North West of Hill 60, near the head of Shaw Creek, which also flows southerly into Cowichan Lake.

I have marked the positions of these deposits on the Dominion Geological Survey map attached to this Report.

The area in which the three groups of claims are located is within the limits of the Esquimalt and Nanaimo Railway land grant. This Grant, the boundary of which is shown on map attached hereto, was given by the Provincial Government to the Railway Company in 1885 as a consideration for building a railroad from Victoria to Nanaimo, includes the land, timber and mineral rights with the exception of precious metals. This concession was subsequently sold to the Canadian Pacific Railway Company and considerable areas within the Grant have been sold to private individuals and development companies.

**PROPERTY:**

HILL 60 The manganese deposits of this area have been staked and recorded as mineral claims, and are known respectively as Hill 60, Hill 60 No. 2, Hill 60 No. 4, comprising an area of approximately 120 acres. C. H. Dickie and Associates have acquired a lease from the Can. Pac. Ry.

covering this ground on a royalty basis at a rate of one cent per unit of manganese per ton.

COTTONWOOD AREA. Three mineral claims have been staked and recorded known as the Sentinel, Wonderland and Wonderland No. 2. These claims cover an area of 120 acres and the ground is also secured under lease from the Canadian Pacific Railway to C. H. Dickie and Associates on a royalty of one cent per unit of manganese in each ton sold.

BLACK PRINCE GROUP. This group comprises six claims covering an area of approximately 240 acres staked and recorded under the following names:

Black Prince  
 Black Prince 2  
 Black Prince 3  
 Pacific  
 Pacific No. 2  
 Pacific No. 3.

By referring to the sketch map of claims it will be noted that part of the ground is owned by the Empire Lumber Company, who acquired title from the Canadian Pacific Railway. The principal deposit of manganese so far found is within the Empire Lumber Company's area. This is secured under lease by C. H. Dickie and Associates at a royalty rate of 10% on the market value of the ore shipped, after freight and treatment charges are deducted. The balance of the area is leased from the Canadian Pacific Railway on a royalty of one cent per unit of manganese in each ton shipped.



GEOLOGY The deposits of manganese ore referred to are found within a belt of country rock described by C. H. Clapp as the Sicker series, which include sediments, volcanics and minor igneous intrusives, pre-upper jurassic in age. This belt is flanked on its northerly side by an intrusive igneous rock termed grano-diorite, as shown on Geological map.

Mr. H. C. Cooke of the Geological Survey gives a summary of the sediments of the Sicker series as follows:

"The sediments of the Sicker series consist of four formations. In ascending order they are, the basal tuffs, the hard cherty tuffs, the soft cherty tuffs, and the black slates. Two distinct types of sediment have combined to produce these: comparatively fresh, unweathered material, shown on good evidence to be probably of volcanic origin; and well-weathered, clayey material, probably of terrestrial origin. The basal tuffs and the hard cherty tuffs have been laid down when deposition of the first type was dominant; the soft cherty tuffs, when the factors were of about equal importance; and the black slates, when the principal deposition was of the clayey type.

The basal tuffs are a thin series of beds directly overlying the andesitic flows and of much the same composition. They grade upwards into the hard cherty tuffs which are very fine-grained rocks composed mainly of quartz and albite-oligoclase feldspar, with biotite in some varieties. The soft cherts and black slates are of similar composition, with the addition of constantly increasing amounts of kaolinic and sericitic material.

Dynamic metamorphism has affected the hard cherty tuffs very little; in the other members of the series, however, all original structures have been obliterated except in a few instances, and the rocks have been converted into sericitic schists. The sediments have not undergone any alteration to epidotes, but they appear to have been universally affected by solutions which altered their feldspars to albite, probably at the time of deposition."

The general strike of the cherts or sediments of the Sicker series is approximately N. 45 degrees W. The outcrop bends with the irregular contour of the country and winds its way along the belt at various angles, governed also by an irregular dip of the strata at different points. At Hill 60 the dip is to the South West 60 degrees, but this varies considerably along the belt at the Black Prince Group, while the strike is somewhat similar the dip is to the N.E. 30 degrees due to an uplift in the opposite direction.

ORE OCCURRENCE, CHARACTER, AND VALUE. The hard cherty tuffs form beds of uniform composition and occupy a definite position in the series directly below the soft cherty tuffs, the manganese ore appears to lie within the hard chert formation along side of its contact with the soft cherts, in lens form. As a rule these hard cherts have a fairly uniform bedding rarely over 4 inches, and may be traced without change for considerable distances, but on Hill 60 near the main deposit of manganese, it has to a considerable extent, lost its original stratified character under regional metamorphism.

The chief manganese-bearing mineral in the ore of the Cowichan District is a highly concentrated form of psilomelane with which is associated a subordinate amount of higher oxides, this character of ore especially applies to the deposit at Hill 60 and Shaw Creek, but in the Cottonwood area the ores are found to be largely Rhodonite and Rhodocrosite,

the silicate and carbonate of manganese. The black ore, psilomelane and other oxides are, no doubt, originated from the oxidation of the carbonate. It is interesting to note that according to a sample of the hard chert taken by Mr. W. C. Cooke, the analysis shows 0.38% manganese; it is therefore probable that the ores are concentrated from manganese minerals distributed in the rock and that the ores are secondary, partly formed under the influence of weathering. Manganese oxide usually is most abundant in the upper part of the oxidized zone. In California small deposits of secondary manganese ores occur in areas of radiolarian cherts.

The main ore bodies discovered are of good size, the surface outcrops in the three areas referred to are each about 100' X 20', besides these there are numerous small lenses all of which are unexplored. Although no development has been carried out, the showings of ore are so substantial on each of the three areas, so much so, that actual mining can be commercial as soon as transportation facilities are available. An aerial tramway of say 5,000 feet will be required for Hill 60 to convey the ore from the mine to the railway, which could be constructed and ready to run within sixty days' time, and this property would then be in shape to produce from 25 to 30 tons per day of high grade ore carrying say, 50% metallic manganese and not over 11% silica. The sulphur and phosphorus content is practically nil.

A wagon road 8 miles in length on an easy grade will have to be built to develop and work the Shaw Creek area, which will be necessary to convey the ores to the Canada Northern Railway for transport to the market. This road can be constructed at a cost of say, \$16,000.00.

MANGANESE, ITS USES AND MARKET PRICES.

Manganese is used as an alloy in the manufacture of the greater portion of our high grade steel, the principal need of this metal is in the deoxidation of steel during refining, Manganese is the best known material to produce a dense homogeneous steel free from honey-combing and blow-holes. It is generally added in the form of an alloy of manganese and iron, the high grade material being known as ferro-manganese and the low grade material as spiegeleisen. Manganese is also used in dry batteries, glass manufacture and dyes, but only a small quantity is used for this purpose.

Although there is considerable activity at several mines in the United States and Canada and even with the increased supplies of ore from Brazil and Cuba there is a great shortage of the metal and it is now listed by the War Board as one of the principal essential minerals. The following prices for manganese ore have been fixed by the United States Government as quoted by the Mining and Scientific Press, June 15th, 1918.

Manganese, domestic, 35 to 54%, f.o.b. South Chicago per unit (Government price, effective May 29) \$0.86 - \$1.30

Manganese, domestic, 35 to 54%, f.o.b. east of South Chicago, per unit (Government price, effective May 29) \$1.01 - \$1.45



(Manganese, domestic, penalty of 50¢ to \$1 per ton for 8% and up to 25% silica, and bonus of 50¢ to \$1 for less than 8 and 5%).

A schedule of prices for domestic ore has been arranged by the American Iron and Steel Institute, and approved by the War Industries Board, effective indefinitely after May 28. Prices are per unit of metallic manganese per long ton (2240 lb.), for ore mined and shipped from all points west of South Chicago, Illinois. The prices are on basis of delivery, f.o.b. care South Chicago. When shipped to other destinations than Chicago, the freight-rate per gross ton from shipping point to South Chicago is to be deducted to give the price f.o.b. shipping point. For ore shipped from points east of Chicago, 15¢ per unit is to be added to the schedule given below. Chemical ores are not included. Prices are based on ore dried at 212 degrees F.

Mn, %	Per unit	Mn, %	Per unit
35 to 35.99	\$0.86	45 to 45.99	\$1.12
36 " 36.99	0.90	46 " 46.99	1.14
37 " 37.99	0.94	47 " 47.99	1.16
38 " 38.99	0.98	48 " 48.99	1.18
39 " 39.99	1.00	49 " 49.99	1.20
40 " 40.99	1.02	50 " 50.99	1.22
41 " 41.99	1.04	51 " 51.99	1.24
42 " 42.99	1.06	52 " 52.99	1.26
43 " 43.99	1.08	53 " 53.99	1.28
44 " 44.99	1.10	54 and over	1.30

These prices are net to producer, buyers to pay salary or commission of their agents. In payment, 80% of estimated value of the ore (less moisture and freight from shipping point) to be paid against railroad bill-of-lading, with attached analysis, balance on receipt of ore by buyer.

The above prices are based on ore carrying not over 8% silica and 0.25% phosphorus. Bonuses and penalties are as under:

Bonuses		:	Penalties	
\$10 <sup>¢</sup> 2,	Per ton	:	\$10 <sup>¢</sup> 2,	Per ton
Each 1 <sup>¢</sup> between 8 and 5 <sup>¢</sup>	\$0.50	:	Each 1 <sup>¢</sup> from 8 to 15 <sup>¢</sup>	\$0.50
Each 1 <sup>¢</sup> under 5 <sup>¢</sup>	1.00	:	Each 1 <sup>¢</sup> from 15 to 20 <sup>¢</sup>	0.75
		:	Each 1 <sup>¢</sup> from 20 to 25 <sup>¢</sup>	1.00

For each 1<sup>¢</sup> in excess of 25<sup>¢</sup> there is a penalty against unit price paid for manganese of  $\frac{1}{2}$ <sup>¢</sup> per unit figured to fractions."

Of course it must be distinctly understood that the above market prices are abnormally high due to the curtailment of supply from foreign countries and the present great demand for the metal for munition requirements. During the latter part of 1913 the Carnegie Steel Company's quotation for manganese ores for Chicago deliveries were as follows:

48 <sup>¢</sup> or over	25	cents per unit
46 to 49 <sup>¢</sup>	24	"
40 to 43 <sup>¢</sup>	22	"

The above for ores carrying not more than 8% silica and 0.20 per cent phosphorus. Ferro-manganese quotations during the same period were \$75.00 to \$80.00 per ton with sharp demand. These prices can be considered as a minimum.

HILL 60

Of the three groups of mines already described, the most accessible and convenient property to work in the first instance is HILL 60. To maintain an immediate output and to work the ores economically, a crosscut tunnel should be run to cut the center portion of the ore lens exposed on the

on the surface of a depth of say 30 feet, a raise made to the surface on the ore, and drifts extended on the orebody easterly and westerly the full elngth of the lens. Assuming that the high grade orebody maintains its present width and value, this development alone will block out ready for extraction 100' X 6' X 30' equals 18,000 cu. feet or say, 1800 tons of high grade ore. Further development work could then be continued by sinking on the orebody. I consider the showing of ore on the surface fully warrants the erection of an aerial tram, but the safest plan would be to develop the ore bodies first as recommended. This would mean only 200 feet of work at a cost of say \$2400.00, or \$12.00 per foot by contract. While this development work is under way a skid-road could be built from the railway to the mine at an approximate cost of say \$1,500.00 and ores landed at the railway at say \$5.00 per ton, at the rate of 10 tons per day. The mining and development cost should not exceed \$5.00 per ton, which, together with the cost of haulage to the railway equals \$10.00 per ton. If this plan is followed out \$10,000.00 would be sufficient for development, purchase of compressor, erection of buildings and skid-road to deliver 10 tons of ore per day to the railroad. The development work if started immediately could be finished and an output of 10 tons per day maintained within 60 days' time. The aerial tramway could afterwards be constructed at a cost of say \$15,000.00.

SUMMARY OF ESTIMATED COSTS to equip and develop Hill

60 to mine and deliver 10 tons of ore per day.

Skid-Road	\$1500.00
Buildings	2000.00
Compressor and tools	2500.00
Development	4000.00
	<u>\$10000.00</u>

To equip and develop Hill 60 to mine and deliver 30 tons of ore per day.

Skid-Road	1500.00
Buildings	2000.00
Compressor and tools	2500.00
Development	4000.00
Aerial tramway	15000.00
	<u>\$25000.00</u>

On August 30th the Director General of Railroads in the United States ordered a general reduction in rates on manganese ores. The new carload rates per ton of 2000 lbs. with a minimum carload weight of 60,000 lbs. from the State of Washington to Chicago is \$11.00 per ton, but before considering the question of shipping the ore to Chicago or any foreign point, I might mention that the War Trade Board of Canada is entertaining some proposition to erect an electrolytic Ferro-manganese plant at Vancouver, and with this in view Mr. C. H. Dickie has offered to sell the manganese ores from Hill 60 direct to the Government at a price 10¢ less than the Chicago prices already quoted.

Assuming the value of the ore to be \$75.00 per ton at Chicago prices, the following profits from operations might

reasonably be expected when working only 10 tons per day:

10 tons @ \$75.00 per ton less 10%		\$675.00
Mining 10 tons @ \$5.00 per ton	50.00	
Haulage to Railway @ \$5.00 per ton	50.00	
Freight to Vancouver (say)	25.00	<u>125.00</u>
	Profit per day	\$550.00

Working 30 tons per day after aerial tram is constructed.

30 tons @ \$75.00 per ton delivered Vancouver less 10%		\$2025.00
Mining 30 tons @ \$5.00	150.00	
Traming 30 tons @ 50¢	15.00	
Freight to Vancouver say @ \$2.50	75.00	<u>240.00</u>
	Profit per day	\$1785.00

#### BLACK PRINCE GROUP

The main orebody recently discovered on this area is quite extensive. I have personally sampled the surface exposure of manganese ore over 47 feet across the lens, the results of which will be given in a supplementary report, after a test on the ore has been made for concentration.

#### CONCLUSION.

In concluding this report I may say that the prospects are exceedingly good to put on the market quickly a large tonnage of high grade manganese ore and in view of the present high prices for the ore, I would urge that development work be started

immediately on Hill 60 as the first basis of operation.

Trusting that the views which I hold as to the merits of the whole question may not run counter to the sentiments which in a general way you may now entertain.

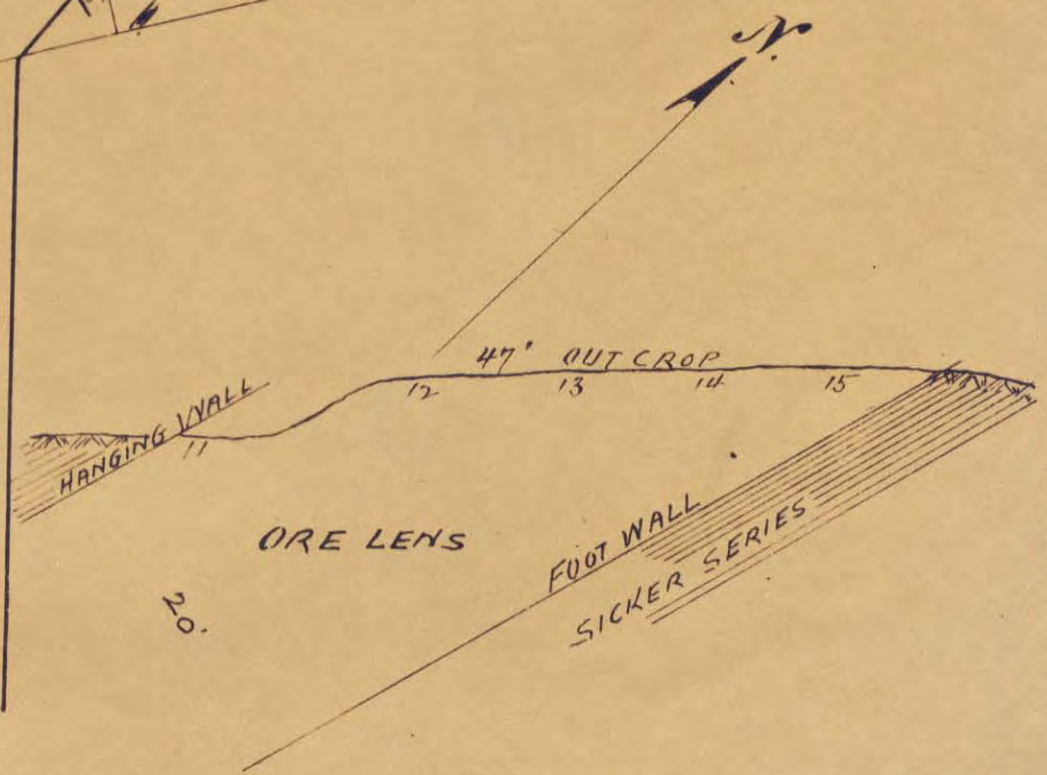
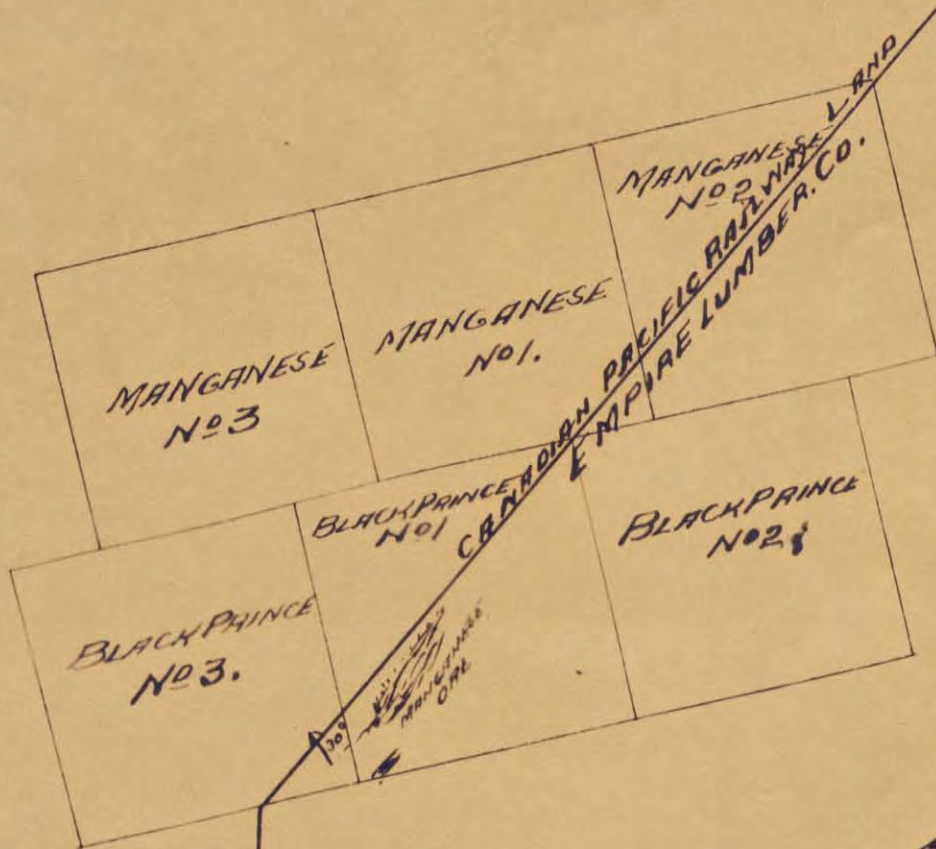
Very sincerely yours,



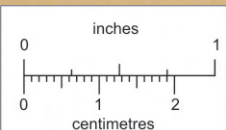
# BLACK PRINCE GROUP

SHAW CREEK.

SCALE 1" = 1000'



CROSS SECTION



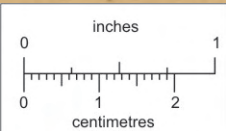
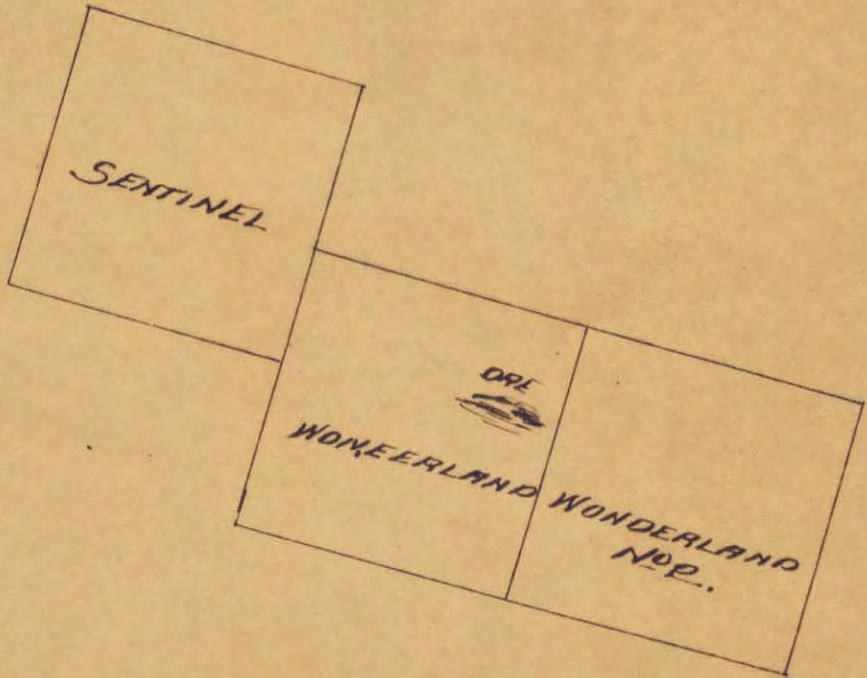
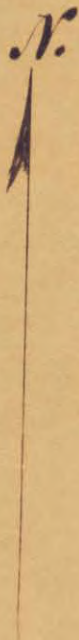
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COTTONWOOD AREA.

COTTONWOOD CREEK.



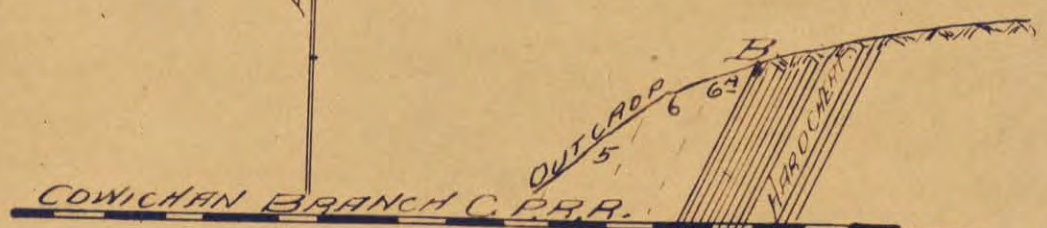
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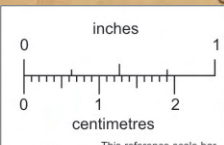


# HILL 60 COWICHAN DISTRICT.

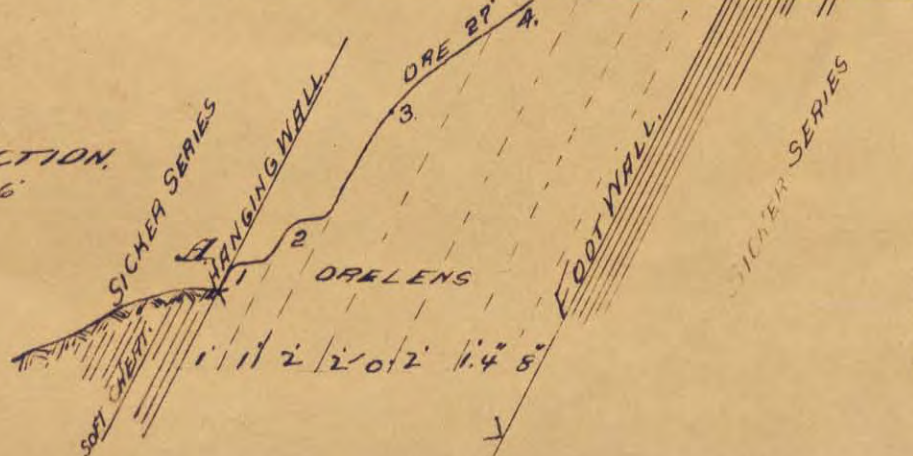
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CROSS SECTION.  
SCALE 1" = 6'



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SAMPLE NO	WIDTH	MN %	SiO <sub>2</sub> %
1	1' 16 <sup>75</sup>	64.3	
2	1' 23 <sup>05</sup>	50.0	
3	2' 40 <sup>00</sup>	14.5	
4	2' 53 <sup>34</sup>	11.0	
5	2' 50 <sup>62</sup>	17.2	
6	1.45260	17.2	
6A	8" 44 <sup>60</sup>	27.2	