File 93A

Moorehead Placer Deposit.

Quesnel B.C.

June 8 1960

A copy to E.O.C.

Dawson City, Yukon

May 25, 1960 93A

MEMORANDUM:

From:

To: rgia St

B.C.

B22319

A		N
	W.S.R.	✓
	G.A.C.	
	G.H.M.	
	E.O.C.	✓
	H.A.P.	
	R.D.S.	
	B.C.B.	
	E.L.D.	
	J.I.B.	
✓	E.C.L.	

RECEIVED JUN 1960

Mr H.C. Webber
Care D.G. Webber
1111 West Georgia St
Vancouver 5, B.C.

Dear Mr Webber:

I have enclosed Annes Report on the Moorehead Placer development programme since I am leaving for Whitehorse in the next few days. I thought you had better heve it in your hands while I am away.

I'll call you when I am returned to Vancouver which will be mid - July,

Yours truly,

Roderick Macree

E.O.C.:

The loud american ballyhoo has Webber in such a state that he does not know if he should write off any development by Vander Ardee and Davis. Possibly by mid-summer, he will have cancelled their option which I understand he can do- legally- at any time,

Rod

copy to E.O.C.

93A.

82319

102/1111 W. Georgia St
Vancouver B.C.
June 8th, 1960

Mr H.C. Webber
Care D.G. Webber
1111 West Georgia St
Vancouver 5, B.C.

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I'll call you when I am returned to Vancouver which will be mid - July,

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	G.A.C.	
	G.H.M.	
✓	E.O.C.	✓
	H.A.P.	
	R.O.S.	
	B.C.S.	
	E.L.D.	
	J.I.B.	
✓	E.C.J.	

Yours truly,

Roderick Macrae

E.O. C.:

The loud american ballyhoo has Webber in such a state that he does not know if he should write off any development by Vander Ardee and Davis. Possibly by mid-summer, he will have cancelled their option which I understand he can do- legally- at any time,

Rod

MAY 30 1960

Dawson City, Yukon
May 25, 1960

1311

A	
W.S.R.	✓
G.A.C.	
G.H.M.	
E.O.C.	
H.A.P.	
R.C.S.	
B.C.B.	
E.L.C.	
J.H.S.	
E.C.J.	

MEMORANDUM:

From: P.M. Kavanagh

To: Mr. W.S. Row

Moorehead Creek Placer Property, B.C.

This memorandum is in answer to your letter of May 18th on this subject, with enclosures which I am herewith returning. I had no prior knowledge of this property which is one of those ancient channel situations in B.C. to which I referred in my last letter.

If the property does contain 18,000,000 cu.yds. of 35¢ ground, and if 360,000 Miners Inch Days of water per season could be made available, there is a reasonable chance that the property could be commercial. I would quickly mention however that the combined yardage and grade information provided is almost beyond belief and the delivered-water potential mentioned is extremely high and probably difficult to realize.

If the indicated Moorehead Mines' production of 1768 ozs. from gravel averaging 42¢ per cu.yd. from a 54 foot section above bedrock is correct, it is strange that Mines recovered approximately 35¢ per cu.yd. from a 150 foot thick section, the extra approximately 100 feet of thickness no doubt being stratigraphically above the 54 foot section and undoubtedly carrying only minor values. I would be inclined to consider that the 42¢ values through the lower 54 foot gravel section is reasonably accurate for the material mined, and that the total 150 foot section would average less than ½ of 42¢ or approximately 20¢ per cu.yd. There is of course no proof at present that the estimated 18 million cu.yds. all contain 35¢ per cu.yd. or even 20¢ per cu.yd; the yardage estimate

itself is open to considerable question.

I do think that the property should be examined and that the examiner should pay particular attention to the following points:

1) availability of tailings disposal room and necessary grade; the carrying away and disposal of 18,000,000 cu.yds. of material is a formidable problem.

2) nature of the gravel, particularly the quantity of large boulders mentioned in Annes' report; the presence of numerous large boulders could be an insurmountable problem.

3) the availability of water for hydraulicking purposes.

4) the nature of the indicated 18,000,000 cu.yd. deposit; whether it could be that very large seam and whether it could in fact be mined hydraulickly; the examiner if possible should pan-test the gravel resting on bedrock at varied sites of his own choice. If there were no gold in the gravel resting on bedrock, it is extremely doubtful whether there would be any in any other part of that particular 150 foot section tested.

The estimated 1,000,000 cu.yd. production rate per 6 month season is a very high one but if it could be done I don't think that the operating costs would exceed 15¢ per cu.yd.

Paul M. Kavanagh

MEMORANDUM:

From: P.M. Kavanagh

To: Mr. W.S. Row

Moorhead Creek Placer Property, B.C.

This memorandum is ~~prompted by~~ in answer to your letter (with enclosures) of May 18th on this subject. (~~with enclosures~~). I had no prior ~~information~~ or knowledge of this property which is one of three ancient channel situations in B.C. to which I referred in my last letter.

If the property does contain 18,000,000 cu·yds of 35¢ ground, ~~XXXX~~ ~~XXXXXXXXX~~ and if 360,000 Miners Inch Days of water per ~~year~~ season could be made available, there is a reasonable chance that the property could be commercial. I would quickly mention however that ~~XXXXXXX~~ the ~~yardage~~ ~~figures given to be~~ combined yardage and grade information provided ~~XXX~~ is almost beyond belief and the water potential mentioned ~~XXXX~~ is extremely high and ~~possibly~~ probably difficult to ~~realize~~ delivered.

If the ~~Mr~~ Moorhead Mines production of 1768 ozs. from gravel averaging 42¢ per cu·yd. from an average ~~depth~~ height above bedrock of 54 feet is correct, ~~I consider~~ it is strange that Ames recovered ~~XX~~ approximately 35¢ per cu·yd. ~~XXXXXXXXXXXXXXXXXXXX~~ from a 150 feet thick section when the extra approximately 100 feet of thickness no doubt was stratigraphically above the mined 54' thick section, and undoubtedly ~~XX~~ carrying ~~relatively greater~~ recoverable values. I would be inclined to consider the 42¢ value through the lower 54 feet of gravel section as reasonably accurate for the material mined, and ~~XXX~~ that the total 150 foot section would average less than ½ of 42¢ or approximately 20¢ per cu·yd. There is of course no proof at present that the estimated 18 million cu·yds ~~would all have~~ ~~XXXXXXXXXXXXXXXXXXXX~~ contains 35¢ per cu·yd. or even 20¢ per cu·yd.

My opinion is that the property should be examined and that the examiner should pay particular attention to the following points:

1) Availability of tailings disposal room and necessary grade: the carrying away & disposal of 18,000,000 cu·yds of material is a formidable problem.

2) Nature of the gravel ~~particularly~~ as to quantity & size distributions & the presence of large

boulders; ~~and~~ large boulders in large quantity could almost defeat the proposition by themselves.

3). availability of water for hyd.

4) nature of indicated 18 million cu yd deposit
— should be pan-tested near bedrock.

Without knowing the answers to the above points it is difficult to estimate ~~dirt~~ costs but I would think that the operating cost of ~~mining~~ 4,000,000 cu. yds in a six month season ~~could not be done~~ would not exceed $150,000 per season or 15¢ per cu. yd. That production rate is extremely high; up here we have a ~~fair~~ ~~sized~~ ~~hydraulicking~~ operation

32 | 6
19 | 20 | 0
24 | 50 | 6
14 | 70 | 0

48
180
38 | 40
48
76 | 40

KERR-ADDISON GOLD MINES LIMITED
SUITE 1616 - BANK OF NOVA SCOTIA BUILDING
44 KING STREET WEST
TORONTO 1, ONTARIO

May 18th, 1960

Mr. P. M. Kavanagh,
Box 248,
Dawson City, Yukon Territory.

Dear Paul:

Herewith a report on a placer show called the Moore-head Mine, and some correspondence between Rod Macrae and Ted Chisholm, both of Prospectors Airways. I am wondering if you know anything about this or could shed any light on it. Needless to say, I do not necessarily concur in some of the figures which E. O. Chisholm has used in his letter to Macrae. Anything you can tell us will be much appreciated.

Yours very truly,

W. S. Row,
President.

WSR:JB

P.S. - Is there a reasonable chance it could be commercial?

WSR

- answered by handwritten letter dated May 25th/60.

HONEY PRINTING SERVICE, TORONTO
STOCK FORM No. 3001

INTER-OFFICE CORRESPONDENCE

FROM Rod Macrae

DATE May 17th, 1960

TO E. O. Chisholm

SUBJECT Moorehead Placer

A		N
✓	W.S.R.	✓
	G.A.C.	
	G.H.M.	
	E.O.C.	✓
	H.A.P.	
	R.D.S.	
	B.C.B.	
	E.L.D.	
	J.I.B.	
✓	E.C.J.	

Reply

(TO BE COMPLETED IN DUPLICATE)

Dear Ted:

Spoke to Webber today; asked him if he was still considering Van Berardee's deal. He says they have 10 days from yesyerday to start their programme or he will cancel, the agreement he has with them.

I told him I thought another deal could be arranged and he will call me next week.

I understand that at the time Annes made his report, the Bullion Mine controlled the water in Moorehead Lake which is not the case now. Webber states he has water rights on Moorehead Creek and Moorehead Lake. and his unexpert opionion is that none of the otherwater systems would be necessary. The map would indicate this may be so as Morehead Lake and Bootjack Lake, its headwaters habve the largest drainage basin in the area, west of Quesnel Lake.

I'll let you know Webber's decision.

Roderick Macrae

HONEY PRINTING SERVICE, TORONTO
STOCK FORM NO. 3001

INTER-OFFICE CORRESPONDENCE

FROM E. O. Chisholm DATE May 13th, 1960

TO Rod Macrae SUBJECT

A		N
	W.S.R.	
	G.A.C.	
	G.H.M.	
	E.O.C.	
	H.A.P.	
	R.D.S.	
	B.C.B.	
	E.L.D.	
	J.I.B.	
	E.C.J.	

MESSAGE

(TO BE COMPLETED IN TRIPLICATE)

Dear Rod:

It is agreed that the Moorehead Placer deposit is difficult to assess because of the skimpy nature of the sampling information. The only factual test would be Annes sluice box run of 9,100 cu. yards and his sampling trench. As you point out the average of the sampling trench and the sluice run would be 34¢ per cu. yard in gold. The platium recovered from the sluice run was 8.8 say 9¢ per cubic yard. The sample trench gave 15¢. If we take the 34¢ for the gold and 9¢ for the platium, we get a total of 43¢ per cubic yard in gold and platium.

To establish thus, a considerable amount of churn drilling would be necessary. If Annes sections were drilled at 100 foot centres this would entail some 45 holes at $1,200. per hole or about $50,000.00. It could be twice this as some of the sections are quite far apart.

The hydraulicking cost you estimate at 15¢ per yard and the net operating profit per yard would be 43 - 15 = 28¢. The gross profit for 18,000,000 yards = $5,040,000 less 10% royalty to owner = $4,436,000.

The life of the deposit at 1 million yards per year would be 18 years so operating profit per year might be $246,400. Annes 1932 figures for the cost of developing the hydraulic system were $250,000. and might be $500,000. today. Other capital costs would include drilling $100,000. and working capital of $150,000. or a total of say $750,000. The pay back of capital would take 3 years.

I would think that on these rough figures we should enquire into it further. You mentioned that there is now water available from Moorehead Lake. Have you any idea of how much this might affect Annes estimate of $500,000 for the low level hydraulic system?

Is Webber considering Van der Aardeen's offer of $10,000 for testing the deposit this year or is he fed up with this crowd now and willing to consider another offer.

EOC:ly

E. O. Chisholm

HONEY PRINTING SERVICE, TORONTO
STOCK FORM NO. 3001

93A

INTER-OFFICE CORRESPONDENCE

FROM ..... DATE .....

TO File SUBJECT Moorehead Ck placer deposits
Long:121-47;Lat:52-38
~~Quesnel River area.~~

MESSAGE

(TO BE COMPLETED IN TRIPLICATE)

The following is a summary of the essential statements in Erle C Annes report to Moorehead Mines Inc, Dec 1, 1933:

Location: On Quesnel River, 70 miles east of Quesnel B.C.

Access: Via existing government roads from Hundred Mile House B.C.

Property: 5 placer leases totalling 400 acres,(originally 10 leases, including the presently held five. Others can be secured by staking Leases held are: 3379-3383 incl.

Reserves: Average depth of the deposit -150 feet

History of production is 1768 ounces produced from gravel averaging $ 0.42 per yard. Average depth where worked was 54 feet.

18,000,000 yards on the existing leases classed as "proven", estimated to contain $0.36/yd at $ 34.00 / oz gold.

Outside existing leases, but in the same valley heads, an"indicated" 30,000,000 yards of same grade.

Sampling: One vertical section length of 150 feet was tested.
Upper 75 feet yielded 0.0140 ozs -835 fineness.
lower 75 feet " 0.139 " " "
Sample total yardage was 12 yards; average value $ 0.36 /yd at $ 34.00 Au.
The concentrates from the sluice boxes of this sampling yielded $ 0.045 platinum at $ 28.00 /oz

History: Gold found on this creek in 1860s. Annes estimates the creek bed was mined for a length of 4200 feet from the mouth of Moorehead, on the Quesnel River, and approx. $ 200,000 in gold removed. 1931-32 Moorehead Mines established a testing plant and removed 1700 ozs gold. Prov. Govt records show production of 1538 ozs removed , valued at $30,166 between 1875- 1945.

Water supply: Various systems outlined by Annes estimated capable of supplying 56 c.f.s at an effective head of 450 ft, and a low-pressure system of 85 c.f.s.

INSTRUCTIONS FOR USE OF THIS FORM

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HONEY PRINTING SERVICE, TORONTO
STOCK FORM No. 3001

INTER-OFFICE CORRESPONDENCE

FROM..... DATE.....

TO..... SUBJECT.....

MESSAGE

(TO BE COMPLETED IN TRIPLICATE)

at an effective head of 110 ft. In addition Moorehead Lak reserves of water are now available, (not available to this property at time of report.)

Grade: First 3800 ft of Moorehead creek has a grade of 4.8%.; to upstream end of existing leases, average grade is plus 6%. (Annes estimates 5%)
He states there is sufficent dumping ground at Quesnel River to dispose of tailing s from a sluicing operation.

Production plans: Annes estimates between one million and one and one half million yards of gravel could be moved per operating season, in a hydraulicing operation, using gravity water. He estimated a cost of operation in 1933 of $ 0.07/yd including plant overhead.

Sources of information:
Erle C. Annes report, less maps. Conversations with Webber, owner of leases.
Note: detailed maps prepared by Annes are not available.

HONEY PRINTING SERVICE, TORONTO
STOCK FORM No. 3001

93A

INTER-OFFICE CORRESPONDENCE

FROM Rod Macrae DATE March 2oth, 1960

TO E. O. Chisholm SUBJECT Moorehead Mine.

MESSAGE

(TO BE COMPLETED IN TRIPLICATE)

Dear Ted:

Enclosed is a summary on a placer gold property in the Quesnel River area, B.C., owned by H.C. Webber, retired bank-manager, of 475 Howe St Vancouver. Property was owned by a miner Jacobie in the 1930s, optioned to Moorehead Mines Inc of Seattle, in 1931, who operated a test plant briefly in 1933, producing 1700 ozs gold. The property was examined and reported on by Erle C. Annes, american placer engineer; his report forms the basis of this summary.

The property was optioned (1959) to an American Oil eploration company who did some re-habilitation of the existing water flume system. Estimate is they spent $7,000.00

Over the past 20 years Webber has aquired sufficent quantities of pipe to provide equipment to start a small mining operation. Ed Parker estimates, following a brief examination, some few years ago, that a combined mining-testing programme could be conducted within two months of starting work, which could determine the grade of the gravels and give an ~~accurate~~ estimate of the yardage available on each of the five leases.

Webber will option the property on a royalty basis; he will lease the equipment , pipe etc for a nominal rental, of a dollar. with the provision that , the company formed on the property will pay for this equipment, when rated production is achieved.

Checked Annes reliability with Donald Fraser, Placer Mining Engineer here. He said he knew Annes, was not too certain of his ability as a consultant.

Opinion: The available information suggests this property could be secured by option for a tenpercent royalty on production. Initial testing to establish the grade woud cost between $10,000 and $15,000. part of which would be recovered in gold values from the testing. Drilling to determine reserves would cost an average $1200 per test hole, but this development-cost would not be faced until after the first season of hydraulicing to determine grade had been completed.

It is estimated that the value per yard of platinum, at present price would pay the mining cost of an operation

Roderick Macrae

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HONEY PRINTING SERVICE, TORONTO
STOCK FORM No. 3001

93A

INTER-OFFICE CORRESPONDENCE

FROM Mr. E.O. Chisholm DATE 29 March 1960

TO Mr. R.M. Macrae SUBJECT

A	N
W.S.R.	✓
G.A.C.	
G.H.M.	
E.O.C.	
H.A.P.	
R.D.S.	
B.C.B.	
E.L.D.	
J.I.B.	
E.C.J.	

Reply

(TO BE COMPLETED IN DUPLICATE)

Dear Rod:

Your placer proposition sounds interesting, but all these placer propositions presuppose a reliable sampling job was done to establish the reserves. This always seems to be the stumbling block. It costs so much to cover the same ground over again.

So, at this stage, we are back to the reliability of Annes, or any other sources of information that would confirm his estimate.

I note that the property was optioned in 1959 to an American oil exploration firm, who are said to have spent $7,000.00. Why did they back out at this stage? Moorehead Mines operated in 1931-32 and were said to have produced 1,700 ozs. The Government records of 1,538 ozs. for 1875-1945 don't agree with Annes' figures.

Is a copy of Annes' report available for examination? I note the maps are <u>not</u> available.

EOC-dp E.O. Chisholm

HONEY PRINTING SERVICE, TORONTO
STOCK FORM No. 3001

INTER-OFFICE CORRESPONDENCE

FROM Rod Macrae DATE April 21st, 1960

TO E. O. Chisholm SUBJECT Moorehead Placers

MESSAGE

(TO BE COMPLETED IN TRIPLICATE)

Dear Ted:

I will have enclosed a print of the Annes Report on the Moorehead Ck placer area with this memo before mailing.

In answer to your memo dated April 13th, regarding this property, the American oil company who optioned the property last year was named Consolidated Oils & Minerals. The man who made the deal for this company was Van der Aarde, and the engineer who advised him on the deal was Dudley Davis. Neither of these men is well known here. Davis is connected with BayShore Mining Company, a SanFransisco company, although he makes his headquarters in Salt Lake City. Hame not had much success attempting to contact Davis; he was here before Easter and I may be able to talk to him although for the present do not think it advisible. Their side of the picture is not completely obliterated; Webber tells me by phone today Van der Aardee has presented a plan to spend $ 10,000 this year on the Moorehead property in testing it.

Annes maps were enclosed with one of the original copies of the report, sent to Seattle some years ago by Webber to a party who expressed interest in developing the property. Webber said he never heard further from the person and never was able to recover the maps.

The record of the B.C. Dept of Mines as shown below for placer production from Moorehead Ck is described i n groups of five years. It indicates that during the period, 1931-35, Moorehead Mines produced 439 ounces of gold,(there is no record of any other operation on this creek at this time.)

(Exerpted from Bull #28, B.C. Dept of Mines)
Placer gold Production, Moorehead Ck (Seven Mile Ck)

1911-1915	-	978 ounces
1931-1935		439 "
1936-1940		115 "
1941-1945		6 "
Total		1538 ounces

H.C. Webber is ~~xxxxxxxxxxxxxxxxxxxxxxxxxxxx~~ a retired Trust company officer, brother of the Webber, whom you know, who is an insurance agent , operating in the Yukon.I consider him reliable.

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HONEY PRINTING SERVICE, TORONTO
STOCK FORM No. 3001

INTER-OFFICE CORRESPONDENCE

FROM Rod Macrae DATE April 7th, 1960

TO E. O. Chisholm SUBJECT Moorehead Ck Placers.

MESSAGE

(TO BE COMPLETED IN TRIPLICATE)

Dear Ted:

Regarding Annes report for Moorehead Mines on Webber's placer claims:

Webber does not think Annes report reliable and this judgement is based on his long association with the claims and and the old prospector who worked them in partnership with him.

Annes report, less the maps is in my files, and if you wish to examine it, I would have to have a print made. Webber would perfer not to let the orig. go forward as it is the only copy in existence.

Re your other comments:

Barker thinks the first test of this property would have to be to determine the grade of the gravels, and based on an examination he made a few years ago, he figures this could be done for a figure between 5000 and 10,000 dollars in one season, using the equipment now available on the property. I gather the main expense would be the rental of a bull-dozer and the construction of the sluice boxes. Piping and monitor equipment are already available.

If a satisfactory grade and recovery could be determined the first season, the next step would be to determine the proven reserves, by the usual churn-drill sections.

Barker thinks that the costs of this two-season testing to determine grade and reserves could be recovered to some extent from the gold mined during testing. He thinks this property is unique in this respect. Webber agrees, that in any option deal the gold receipts could be credited against the expense of proving the ground, up to the time when normal mining at a profit could be started.

Webber reports the American oil company conducted a rather inefficent programme last year. A crew was moved in; lumber for sluice boxes was purchased. A bull-dozer was purchased, but delivery was not ~~effected~~ delivered until too late in the season to make effective use of it. No -one was on the ground to supervise the operation and most of the pre-season preparation work went by default,

Roderick Macrae

Roderick Macrae

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HONEY PRINTING SERVICE, TORONTO
STOCK FORM NO. 3001

INTER-OFFICE CORRESPONDENCE

	A	N
W.S.R.		✓
G.A.C.		
G.H.M.		
E.C.C.		✓
H.A.P.		
R.D.S.		
B.C.B.		
E.L.D.		
J.I.B.		
E.C.J.		

FROM Mr. E.O. Chisholm DATE 13 April 1960

TO Mr. R.M. Macrae SUBJECT Moorehead Creek Placers

Reply

(TO BE COMPLETED IN DUPLICATE)

Dear Rod:

Please make a copy of Annes' report and send it here. This is the only report available, apparently, factual or not. One can't help but be intrigued by the 18-million yards of possible 0.36 cents per yard grade amenable to a cheap sluicing operation. If you could move a million yards a year at anywhere near 7 cents a yard, as Annes claims, it would be a nice operation. Especially when capital costs are so low in hydraulic mining.

I still think we should investigate more fully the American Oil Company that held it last year. What is their name and could we get their side of the picture? Incidentally, where are Annes' maps of the testing he did? Someone must have them. Why isn't there some record at the B.C. Department of Mines of the Moorehead production in 1931-32?

What kind of a man is Webber? Do you consider him reliable?

Please let me know your own opinion as to the merits of the property.

E.O. Chisholm

EOC-dp

HONEY PRINTING SERVICE, TORONTO
STOCK FORM No. 3001

INTER-OFFICE CORRESPONDENCE

FROM..... **DATE**.....

TO..... **SUBJECT**.....

MESSAGE

(TO BE COMPLETED IN TRIPLICATE)

Opinion:
It is pretty hard to give an opinion of a property you have not seen and I tend to lean rather heavily on Ed Barker's opinion of this property which is favorable.

I have seen 40 ounces of gold that has been recovered in recent years from these leases. Webber claims it came from various locations over a length of 1.5 miles on the creek, partly from bedrock locations, partly from bench gravels.

I think it likely there is something of the order of 18,000,000 yards of gravels on the leases and I think it is anyone's as to the grade of these gravels.

I wouldn't put too much reliability on Annes' estimate of the grade, and I judge, from Barker's estimate that the cost per yard of hydraulicing would be nearer $ 0.12 per yard than 0.07

Will enclose the copy of Annes report as soon as it is printed,

Encl:

Roderick Macrae

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REPORT

ON

MOOREHEAD

MINE

IN

QUESNEL MINING DIVISION

CARIBOO DISTRICT

BRITISH COLUMBIA

By

ERLE C. ANNES

Dec 1/33

TABLE OF CONTENTS.

TABLE OF CONTENTS (Continued)

MAPS

Seattle, Washington,

December 1, 1933.

Moorehead Mines, Inc.,

717 McDowall Bldg.,

Seattle, Washington.

Gentlemen:

I beg to submit herewith my detailed report on the Moorehead Mine, Quesnel Mining Division, Cariboo District, British Columbia. This report is revised to date in the light of more recent data acquired during the past year.

Trusting this report contains the information required, I beg to remain,

Yours very truly,

"Erle C. Annes," R. P. E.,

Consulting Mining &
Geological Eng.

Dec 1/33.

SUMMARY AND CONCLUSIONS:

The development of a successful hydraulic gold mining project postulates, in nature, four basic essentials; they may be enumerated as follows:

1. A deposit of auriferous gravel, containing sufficient recoverable gold to return the capital required to develop the property, together with interest thereon, plus a profit commensurate with the risk involved.

2. An adequate water supply delivered under a head great enough to render the above economical gold recovery possible.

3. Sufficient grade and room in close enough proximity to the property to dispose of all tailings resulting from hydraulic operations.

4. Sufficient sluice grade to insure the removal of material and at the same time permit of the installation of efficient gold saving devices.

That an ancient river of considerable magnitude once flowed through Little Lake Valley and what is now the Moorehead property is a premise which the evidence submitted safely establishes; and that this stream was a part of the Quesnel River, known to be gold bearing throughout its length, appears equally certain. It has further been shown that four natural and artificial sectional cuttings of this channel, or phases thereof, on the Moorehead Property, have proven it to be of large section and extent, and to carry gold values which may be economically extracted at each such point of cutting. Application of recognized principles of sampling and the laws of geological deduction, apparently justify the assumption that the ancient channel holds its size and values between the four points of cutting, and to some extent on either side. Measurements and estimates of the extent of this channel show over 18,000,000 cubic yards which may be assumed and classified as "proven" and point to an additional 30,000,000 cubic yards on the other leases and unstaked ground available, which are classified as "indicated." At the same time these observations give evidence of exceptional values in concentrates containing both gold and platinum and in the gravels of tributary channels, all of which are classified as "possibilities."

Detailed surveys, estimates, maps, plans and specifications completed during the past few years, show that an adequate water supply the water supply to the Burns Unit is now available

is available and can be delivered under sufficient head to render economic hydraulic operations possible. It has also been shown that dump room for the disposal of tailings and sufficient sluice grade for the removal of material and to ensure the installation of satisfactory gold saving devices can be obtained. The three remaining basic essentials are, therefore, satisfactorily provided.

In addition to the above, the property offers the following advantages: easy accessibility, good transportation facilities, sufficient labor supply, satisfactory wage scale, favorable climatic conditions, longer working season than is afforded in other parts of the Cariboo District, good bed rock conditions, absence of boulder clay in the deposit and a timber and fuel supply easily available.

Considerable development work has been done on the property by Moorehead Mines, Incorporated, and its predecessors and these operations have resulted in a production of 1768 ounces of gold with a total value of $30,945.00. Balanced against square feet of bedrock uncovered to date and super-imposed yardage removed therefrom, these results show, on the basis of former gold prices, an average value per cubic yard of about 26¢ as against an estimated value from sampling of 22¢ per cubic yard. On the basis of current prices this amount of gold would have a value of about $50,000.00 and would show an average value per cubic yard for the superimposed material of approximately 42¢. Without materially exhausting or detracting from the value or assets of the mine, such results are sufficient to illustrate what may be done with the property and to remove it from the prospect class.

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A summary of the above facts, then, forces the following conclusion: There are no large hydraulic gold properties in the Cariboo District or elsewhere which, to the writer's knowledge, offer such a combination of conditions favorable to successful hydraulic mining as does the Moorehead Mine. It appears very certain that completion of the project as recommended in this report, followed by operations in which recognized mining principles and efficient management are exercised, will meet with financial success. On the above assumptions the writer can unhesitatingly recommend the thorough development and operation of this property.

Respectfully submitted,

Erle C. Annes, B. E.
Consulting Mining & Geological Engr.

RECOMMENDATIONS:

Not necessary

The Low Level Hydraulic System as described under "Water Supply" has been installed with a maximum capacity of 2000 Miners' Inches (56 c. f. s.) and used intermittently during the past two seasons. In such capacity it has satisfactorily served for quantity test runs which further prove the property but it is no longer useful as an operating unit until the proposed High Level Hydraulic System, in conjunction with which it is to be used, has been installed. In the meantime its capacity should be increased to 3000 Miners' Inches (84 c. f. s.) as already recommended, by lining the ditch portions with metal flume and installing a small storage dam at Long Lake.

With the Low Level System completed the next step should be the construction of the proposed High Level Hydraulic System. This program involves construction of the high level flume and pipe line from Warman Creek to the pits, together with the development of 8-Mile Lake and Three Mile Lake watersheds as described under "Water Supply;" it should also necessarily include sluice tunnel, sluice and raise, lighting plant, telephone and signal systems, camp constructions, etc.

In following the above program it would be advisable to concentrate efforts on the early completion of the High Level flume and pipe line, the sluice tunnel, sluice and raises, and the development of the 8-Mile Lake watershed area so that a short run might be obtained from the water of this and the Little Lake-Long Lake areas as soon as possible. The Three Mile Lake area will require at least a full construction season to complete. The above work must be preceded and accompanied by final location and construction surveys.

A section of shallow drill holes across Moorehead South channel should also be put down along Moorehead Creek just above its confluence with Little Lake Creek in order to determine the exact bedrock gradient of this channel. This information will be the chief deciding factor in the final determination of permanent sluice grade.

N/A

The construction and installation of the two inter-operative hydraulic systems as outlined above will complete a plant having a maximum capacity of 5000 Miners' Inches (140 c. f. s.) for purposes of handling the

flood peaks, and an average operating capacity of 2000 Miners' Inches (56 c. f. s.) for 180 24-hour days of each season.

LOCATION: (Ref. maps 1 and 2.)

The Moorehead Mine is located in the Quesnel Mining Division, Cariboo District, Province of British Columbia, Canada. More exactly described, the location is on Moorehead Creek near its confluence with the Quesnel River. The latter stream is one of the principal tributaries of the Fraser River and empties into it at the town of Quesnel, sixty-five miles to the Northwest. The mine is distant from Williams Lake, the nearest station on the Pacific Great Eastern Railway, about fifty miles by motor road.

PROPERTY AND TITLE: (Ref. Maps 1, 2 and 3).

The property consists of the following leases, the numbers, locations, and boundaries of which are shown on the accompanying maps. These leases were issued by the Provincial Government of British Columbia, the tenure being for a period of 20 years, with the privilege of renewal at the expiration of that time. They are listed as follows:

Lease No.	Classification	Acreage
1535	Bench	80
1536	"	80
1651	"	80
1652	"	80
1653	Creek	20
1654	"	20
1705	Bench	80
1706	"	80
1707	"	80
2288	Creek	80

5-50 acre [illegible]

3379-

3383 [illegible]

Title to all the above leases is clear and subject only to the terms of assignment.

With an active plan for the further development of this property definitely undertaken, it will undoubtedly be possible to lease other valuable adjacent ground in the same manner.

HISTORY OF DISCOVERY AND DEVELOPMENT: (Ref. Photos 4 to 11).

The history of the discovery and development of the Moorehead Mine is a repetition of the history of the entire Cariboo District. The first discoveries made by the early miners of the precious metal, proved to be

exceptionally rich. These deposits were soon exhausted, however, and the miners departed for other creeks where their primitive methods would still yield the high returns already proven possible on the first discoveries.

These men were followed by the Chinese, who by their more economical methods of working and living, were able to mine, at substantial profit, the lower grade gravels left untouched by the original stampeders. There came the time when even the Chinese were unable to operate profitably, and the Cariboo District here entered upon the third stage of its development - that is, the exploitation of the vast deposits of low-grade auriferous gravels by companies and individuals with sufficient capital to launch and operate large hydraulic and underground mining projects.

Owing to the fact that all the equipment required for these operations had to be freighted over land for 200 miles or more, the initial costs often proved too great. This fact, coupled with poor management and costly experiments, caused the undoing of several ambitious schemes. These failures, however, should not adversely influence development of the low grade gravels of the district, since it has been fully demonstrated that such deposits can be worked at substantial profits.

The present advent of railway and motor transportation into the Cariboo District marks the fourth stage of development. This stage should be as productive of results as the operations in the other two large placer areas of the continent -- namely, California and the Alaska-Yukon fields.

Moorehead Creek, on which the Moorehead Mine is situated, was one of the first creeks to be staked by the early miners during the initial stages of the Cariboo gold stampede in the early '60s, and has been intermittently worked in a small way by various groups and individuals, mostly Chinese, since that time.

In 1931, Moorehead Mines commenced construction work on the property with a view toward the completion of the first permanent construction unit or what is known as the "Low Level Hydraulic System." This includes the development of about 17 square miles of watershed area, about one fourth of the area available for future development, and involved the construction of a storage dam at Little Lake, a diversion dam at the confluence of Moorehead

and Little Lake Creeks, about 1500 feet of ditch and flume, a penstock and 1000 feet of pipe line, installation of monitors, construction of sluices, road building and a beginning on permanent camp construction. This plant has a capacity of 2000 Miners' Inches (56 c. f. s.) but with very little work this may be increased to 3000 Miners' Inches (84 c. f. s.). This stage of the work was completed on October 30th, 1931, and the water turned through on November 1st. One week's piping, entirely on valueless sluff and overburden which had caved into the pits, was then obtained before freeze-up. The plant was closed for the season on November 7th, 1931.

In April, 1932, the plant was reopened with the start of the spring run-off and piping was carried on intermittently with construction and reconditioning work until July 1st, 1932. The sluices were then extended and piping was resumed for another 14 days actual operating time, or until the available stored water was exhausted. The balance of the season was spent on preliminary construction work, principally in connection with the Bridge Lake Project. Camp was closed on Nov. 1st, when the freeze-up occurred.

During the past season, test runs were made intermittently with the water available from the Low Level Hydraulic System, a total of 32 days actual piping time being consumed. Aside from sluices and undercurrents, no permanent construction was attempted. The work, however, was very satisfactory from the standpoint of quantity test runs.

TOPOGRAPHY: (See Maps 1, 2 and 3 and Photos 1 to 11).

The area under consideration lies within and toward the eastern edge of the Great Interior Plateau region of British Columbia. This plateau rises gradually from the deep valley of the Fraser River, its main drainage channel 25 miles to the west, until it merges imperceptibly with the Alpine snow-capped peaks of the Cariboo Mountains, about twenty miles to the eastward of the area. The configuration of the Plateau in this region is typical of a deeply dissected peneplain. The valleys, which have a general northwesterly trend, are deep and fairly broad, and in their U-shaped cross section exhibit evidence of moderate valley glaciation. This glaciation was probably characterized by several distinct stages occasioned by climatic changes and involving alternate advances and recessions of the ice, interspersed with

heavy fluvio-glacial action and correspondingly heavy inter-glacial deposition as evidenced by the extensive deposits of glacial, inter-glacial and fluvio-glacial materials which now cover the pre-glacial valley floors. The post glacial and present streams have incised deep, V-shaped valleys into this material, and in other places, where their entire courses have been changed, they have cut wild and picturesque rock canyons.

The summits occupying the inter-stream areas are all below timber line, and rarely attain an elevation greater than 4500 feet above sea level, or a regional relief of more than 2000 feet. They are flat, table-topped, and evenly crested, and represent erosion remnants of the ancient land surface.

GENERAL GEOLOGY: (Ref. Maps 1, 2 and 3, and Photos 1 to 11)

The rocks of this area, designated as the Quesnel River Series, consist of metamorphosed sediments and volcanics of many phases, many of which are highly altered and distorted and with definite strike and bedding often obscure. These rocks have been referred by Dawson, Bowman and others, to the Mesozoic, probably Jurassic and Lower Cretaceous, and are unconformable with the older Paleozoic Cache Creek series to the southwest, and the Pre-Cambrian Caribqo series to the east and northeast. Throughout the length of the Quesnel River, as well as at other points, this series of rocks is notable for its yield of auriferous gravels. Any rocks of Jurassic age, which may be exposed in the area, are probably represented by the dark, altered types to be found in the deeper portions of the South Fork Canyons.

The series has been intruded, probably in late Cretaceous or early Tertiary times, by both acidic and basic magmas. Apophyses from these intrusions have since been exposed by erosion, and now appear as porphyry dykes cutting the older formations. It is believed that these dykes bear an important relation to the mineralization of the country rock and hence to the origin of the placers themselves, since it is undoubtedly from the erosion and disintegration of the intruded formations that the auriferous gravels of the area have been derived. These gravels were the first to be discovered and profitably mined in the Cariboo District.

The general structure is that of a synclinorum whose transverse axis extends approximately sixteen miles in a south-westerly direction from Quesnel Forks. The area under consideration, therefore, occupies a portion of the north-eastern flank of the structure, and the general dip of the rocks, which is low, is to the southwest. The general strike is to the northwest in conformity with the ridges and valleys.

Peneplanation, followed by uplift and mature redissection, characterized the Tertiary period. During these times a thickness of from one thousand to three thousand feet of rock was removed by erosion, and the ultimate concentration of the values contained in this great thickness, gave rise to the pre-glacial auriferous gravels of the district.

Vast accumulations of ice in Pleistocene times completely filled the valleys and over-rode the highest summits. In some instances the pre-glacial stream gravels were removed by glaciation, and in others the stream courses were effectually blocked and diverted by great quantities of glacial drift and debris. The general result, however, was a rounding of the summits and a widening and deepening of the valleys to their present typical, U-shaped glacial cross section. With the retreat of the valley glaciers, glacial erosion, as previously stated, gave place to glacial deposition, and the valleys were floored with extensive deposits of fluvio and inter-glacial materials. In recent times the streams which reoccupied the old valleys have been engaged in cutting through these deposits to bedrock, a task with which they are still occupied.

LOCAL GEOLOGY:

The geological history of the gold-bearing gravels of the Moorehead placer deposit is that of the South Fork of the Quesnel River which joins the North Fork at the settlement of Quesnel Forks, seven miles to the north, thus forming the main Quesnel River. This stream, in turn, flows in a northwesterly direction to its confluence with the Fraser River at Quesnel, about seventy miles distant.

In Tertiary times the South Fork flowed north through the valley of Quesnel Lake, which, as a lake, was probably non-existent in those times. From a point near the present northern end of this lake, the ancient river turned gradually to the west and continued its course through the valley now

occupied by Long Lake, Little Lake, and the lower part of Moorehead Creek, until it joined the North Fork near what is now known as the Moorehead Mine. The stream remained in this course long enough to trench a valley four or five hundred feet in depth and several times that distance in width. It was a well established river of considerable size, probably much larger than the present South Fork. For purposes of reference, this channel will be known as "Moorehead North."

Toward the close of the Tertiary, this ancient river was robbed by a small stream which flowed into the North Fork at a point about two miles west of the old town of Quesnel Forks. This pirate stream, insignificant in size as compared to the river which it robbed, gradually worked its head waters back until it tapped the old river about two and a half miles west of the present settlement of Likely. On account of its then steeper grade and shorter course, this stream was able to divert the entire drainage from the old South Fork and to leave the channel of that stream from the point of robbery to the confluence at Moorehead, high and dry. The South Fork then continued in its new channel for the short period remaining until the close of the Tertiary and during its occupancy established a secondary valley of considerable importance, which now is known as the Bullion Channel, and which has since been exploited by operations conducted at the Bullion Mine, and has yielded several million dollars in placer gold.

In Pleistocene times it is doubtful if any deepening of the Moorehead North Channel took place. The valley was undoubtedly filled with ice and there must have been some ice movement in the direction of the grade. However, since this grade was low and the valley had long since been deserted by its parent stream, it is very doubtful if the glacier which occupied it had sufficient erosive power to remove in any great part, the pre-glacial stream gravels. The immense amount of detritus given up by the melting glaciers was roughly sorted by the glacial streams and deposited many feet in thickness as the present valley flooring forming the over-burden of the pre-and inter-glacial gravels.

The greatest erosive effect probably took place in the Bullion Channel, which was first subjected to a heavy canyon cutting process. This intense action apparently removed from in situ the pre-glacial gravels of

the channel. In the Bullion pits at least, there is definite evidence to support these conclusions. The several stages of glaciation which followed were apparently interspersed with heavy fluvio-glacial action which in turn, throughout dissection of a portion of the "Moorehead North" channel, provided the inter-glacial gravels containing the principal values recovered from the Bullion operations.

Near the close of the Pleistocene the South Fork suffered its second accident, being robbed again by a small stream which joined the North Fork at the present town of Quesnel Forks, and which headed at a point about one mile due south of this settlement. The robbery was probably aided by glacial and fluvio-glacial action, but once accomplished, the entire drainage of the Quesnel Lake Basin and tributary glaciers came out that way; this is the course of the present South Fork of the Quesnel River, a recent, post-glacial stream, which has since been engaged in cutting the present South Fork canyon through the glacial and fluvio-glacial materials and in places well into the bed rock itself.

The drainage of the ancient "Moorehead North" valley has since been taken care of by smaller streams, such as Moorehead and Little Lake Creeks, which converge about a mile from their confluence with the Quesnel River. Below this point of convergence, the creek has trenched itself a deep V-shaped valley through the superficial glacial and post-glacial deposits, the pre and inter-glacial stream gravels of the ancient river, and in places some distance into the bedrock. Wherever this post-glacial valley cut into the ancient river channel and tributary channels, a rich reconcentration of the gold values contained in the old gravels resulted. These reconcentrations constituted the rich creek deposits worked by the original stampeders and the Chinese.

SUPERFICIAL DEPOSITS: (Ref: Maps 1, 2 and 3, Photos 9 to 11).

1. The Moorehead Channel System.

The course of the "Moorehead North" Channel is marked by the prominent U-shaped valley of considerable width and depth, now occupied by Long Lake, Little Lake, Little Lake Creek, and the lower portion of Moorehead Creek. This valley, known locally as Little Lake Valley, is one of the most prominent topographical features of the area, and with the

section of the vegetation and the recent V-shaped trenches cut near their confluence by the two creeks mentioned, probably appears today as it did at the close of the glacial epoch.

The auriferous gravels of this channel system have been exploited near the northwestern extremity of Little Lake Valley on the leases now comprising the Moorehead Mining property. The deposits have been partially exposed in cross section at four distinct points and in longitudinal section at various points throughout the distance of over one mile.

At one of these points, near the southeastern boundary line of Lease 1536, the present Moorehead Creek has cut directly through its ancient channel and at right angles to it. While the faces of the gravel deposits so cut are now largely covered by slide and vegetation, both rock rims are still exposed, and it was from the gravels reconcentrated from this section by Moorehead Creek that the early white miners are said to have recovered about $200,000.00. The evidence offered here, while not conclusive, gives a fair indication of the size of and the values to be expected from this section of channel, which probably represents the old channel of Moorehead Creek at a point a short distance above its pre-glacial confluence with the ancient channel of the South Fork of Quesnel River, or "Moorehead North." This section of channel is known as "Moorehead South."

NO other evidence

A second point of sectional cutting occurs about 500 feet down stream from the junction of Little Lake and Moorehead Creeks. Here the creek cuts obliquely through a large channel which comes in from the northeast and joins the old Moorehead Creek channel on the south side of the present creek to form "Moorehead South." Here both rims are exposed and the reconcentrated gravels have been worked extensively by both whites and Chinese. This piece of channel probably represents a phase or stage of development of the main "Moorehead North" channel.

Another of these points of sectional cutting is situated about seven-eighths of a mile northwesterly and down stream from the above mentioned location. Here the Quesnel River, and the glacier which occupied its valley, have again truncated both "Moorehead North" and "Moorehead

South" channels in a direction at right angles to their courses. At this place also, the rims can be located but the gravels themselves are largely covered by vegetation and slide. However, the bed of Moorehead Creek has been extensively worked in the past for a distance of 4200 feet, the alluvial fan formed of the materials washed from Moorehead Creek carries appreciable quantities of gold, and the flats of the Quesnel River in this vicinity have been considered of sufficient value in the past to warrant the installation of dredging machinery. The evidence offered here is corroborative to that submitted in the previous paragraph.

The fourth point of cutting of the ancient channel, and probably the most important in point of evidence, is located near the pits about half way between the last two points mentioned above. Here Moorehead Creek and its tributary, Little Lake Creek, the two streams which have taken care of the post-glacial drainage of the vicinity, have, as previously mentioned, joined forces in trenching the deep, recent, V-shaped valley through the over-burden of glacial and fluvio-glacial material and the underlying pre and inter-glacial gravels, and in places well into the bedrock. A partial cross section of the gravels, over-burden, and bedrock of "Moorehead South" is also exposed in the pits of the Moorehead Mine on leases 1535 and 1536.

C. Over-burden.

The over-burden, where sampled in the pits, had a thickness of about 75 feet; it consisted of glacial and fluvio-glacial tills, silts, sands and gravels. The contained values in gold were provisionally estimated, as a result of the sampling, at about 4¢ per cubic yard. At the present price of gold, however, this figure increases to 6¢ per cubic yard. Owing to the irregular nature of the deposit, these upper values are not evenly distributed and no well-defined pay streak was located. While these values are not sufficiently high to permit of the upper deposits being worked alone, profitably, the occurrence of such an over-burden is an advantage, since the argillaceous material contained therein acts as a carrier for the coarser material of the lower deposits containing the principal gold values. In the process of hydraulicking, the two materials mix, with the result that the entire section can be worked more economically, assuming efficiency in recovery, than could the lower section alone.

3. Paystreak.

That portion of the deposit designated as the paystreak gravels immediately overlie bedrock and represent definite pre-glacial river deposition. A large percentage of these gravels are rounded and well worn but are mixed with angular or slightly rounded pieces plucked from immediately adjacent bedrock. These gravels are tightly packed and the interstices filled by an argillacious matrix. The color is a distinct brownish red, characteristic of all pre-glacial gravels derived from the Quesnel River series of rocks. Where sampled in the pits they had a thickness of about 75 feet. As a generalization it may be said that for any given point in the channel they represent about one-half the total depth of the deposit. The nature of these gravels obviously precludes the possibility of the presence of boulder clay.

paystreak 75' thick could be a record

The greatest concentration of gold values is undoubtedly on bedrock where values as high as $30.00 to the cubic yard have been found. Aside from this, the values appear to be more or less evenly distributed throughout these lower gravels.

The total production of Moorehead South channel to date is about 1768 ounces. This production was obtained from about 59,000 square feet of bedrock overlain by gravel to an average depth of 54 feet. This works out to a value of about 42½¢ per cubic yard at the current price of gold. These results compare favorable with the writer's earlier sampling of the pit faces which indicated an average value of 22¢ per cubic yard based on the former standard gold price of $20.67 per ounce, or about 36¢ per cubic yard on the present price of gold.

apparently Cariboo Hydraulic all the Creek worked since 1911 to get this figure of 59,000 sq ft

A further check on the estimated average values of 22¢ per cubic yard at the old price of gold or 36¢ per cubic yard at the present price is to be found at the point where Moorehead Creek cuts through the old channel near the south-eastern boundary line of lease 1536. Here it is estimated that about 1,000,000 cubic yards have been removed from the channel by erosive effects of the creek. From the gravels in the creek bed reconcentrated from this eroded section of channel, the first white miners are said to have recovered $200,000.00; this roughly would indicate values in the original channel gravels at this locality of approximately 20¢ per cubic

yard at former prices or about 33¢ per cubic yard at present prices: this closely checks the values obtained at the pits, and since the creek as yet has not reached bedrock it is probable that the richer values are still to be recovered. Again, at the section previously mentioned, seven eighths of a mile down Moorehead Creek and where it debouches into and is cut by the Quesnel River Valley, good values in the creek bed, alluvial fan, and river flats are definitely known to have occurred. Since most of this material represents outwash from Moorehead Creek, and hence reconcentration from the old channels, it seems fairly obvious that appreciable values still persist in the channel gravels at this point.

At the present time the pit extends an average distance of about 250 feet into the old channel known as "Moorehead South" in a direction normal to its course. The extent of these workings appear to have reached mid channel. Since there is no reason to suppose that the channel is unsymetrical in cross section, it is logical to assume an average width of 500 feet or double the distance from rim to mid channel.

There is then very definite evidence of an extent of channel on the south side of Moorehead Creek approximately seven-eighths of a mile in length and with an original average depth of about 275 feet. Its average width does not appear to have been less than 500 feet with symetrical side slopes of 45 degrees. The content of such a section of channel would be about 24,000,000 cubic yards. Of this yardage, no more than 75% or 18,000,000 cubic yards may be classed as ground proven, partially through the action of natural agencies and partially by mining operations as outlined above. The remaining 25% has apparently been removed by the erosive action of Moorehead Creek. Such erosive action has been largely confined to the overburden but in the few places where the underlying pay gravels have been affected, the action, as evidenced by sampling and exploration, has been one of reconcentration and enrichment rather than depletion.

Moorehead North.

Good additional indications of workable yardage are offered on leases 1651, 1705, 1706 and 1707 on the north side of Moorehead Creek. This ground was formerly held by the Bullion owners and later by John Hopp, who through failure to comply with Government requirements in 1921, allowed it to

It was then immediately re-located by the Moorehead Mining Syndicate, and included with the Moorehead Mine. While held by the owners of the Bullion this ground formed a part of, and in fact it was believed to be the key position to their proposed operations in connection with the exploitation of the Moorehead Channel, since the existence of the "Moorehead South" channel across the creek on leases 1535 and 1536 as discussed above had not then been established.

* * *

Under the direction of Bullion executives two tunnels were driven northerly through the rock rims into the gravels of the leases on the north side of Moorehead Creek. Favorable results were obtained and further prospecting followed. The later tests were said to have been more encouraging and the ground was definitely included in the plan of future hydraulic operations of the company. Sections of Moorehead Creek prepared in 1896 by L. F. Warner, Jr., Engineer for the Bullion Mine, are available together with the writer's maps accompanying this report. Warner's map and sections show the approximate locations of the old tunnels and indicate something of what was expected in regard to channel location, size, and occurrence of auriferous gravels. It is believed, therefore, from the evidence obtainable, that a definite section of channel runs through this ground, that it is of considerable extent and value, and that a phase of it merges with and forms a part of the section of channel on the opposite side of the Creek in the vicinity of the confluence of Moorehead and Little Lake Creeks, to form "Moorehead South." Whether or not this section of channel is earlier, later, or contemporaneous with that of "Moorehead South" on leases 1535 and 1536 must be decided by the results of further exploration and development. There is sufficient evidence to warrant such a plan being proceeded with, once development of the property as a whole is undertaken.

An additional excellent possibility is offered farther up the valley to the southwest on the unlocated channel ground adjoining the leases. As previously stated, no definite basis is available at present on which to estimate the value of this ground. The cubical content of the channel here may be taken roughly as 500,000 cubic yards to every 100 feet of linear extent. Assuming continuity of channel and values, the workable hydraulic ground will depend entirely upon the channel bedrock grade; this, in respect to the additional ground mentioned, is indeterminate at the present time, except that on the basis of evidence available it may be placed between a 1½% and a 2½% grade.

as a medium, the writer has assumed a 2% grade. It is quite reasonable to expect that an additional 30,000,000 cubic yards of workable hydraulic ground may be developed here and in "Moorehead North" on the north side of the creek, and this quantity may be taken as the indicated yardage available.

Still another excellent possibility lies in the gravels of the pre-glacial channel of Moorehead Creek, to the south, and above its confluence with Little Lake Creek. This channel has been cut by the post-glacial canyon of Moorehead Creek about a mile above this point of confluence and where cut the reconcentrated gravels have again yielded well as evidenced by the extensive old workings. It appears that this is the same channel which is likewise cut through by Moorehead Creek just above its confluence with Little Lake Creek, and if so, as now seems quite apparent, then a very good possibility for at least another mile of old channel which can be worked only through the Moorehead operations is indicated. No estimate of the probable yardage in this additional mile of old channel has been attempted but if it is later found to be workable the life of the property might be prolonged for many years.

The gold contained in the gravels of these channels is mainly coarse, but varies in size from medium fine to nuggets weighing one-half an ounce. The finer gold is contained in the overburden and the coarser in the pre-glacial bedrock gravels. In general, it is flat and well-worn, exhibiting evidence of considerable attrition. Government assay sheets, based on the former standard price of $20.67, show that the gold had a value of about $17.25 per ounce with an average fineness of approximately 835. At the present price of gold this figure would be increased to over $28.00 per ounce. (at $ 34.80 /oz)

4. Bedrock.

As stated previously, the bedrock consists of those rock types of the Quesnel River Series described in a preceding paragraph. The surface has the configuration characteristic of the bedrock in a river channel of this type, containing minor local gutters or channel phases separated from one another by low ridges or local rims. For the most part the gutters are well worn and contain small pot holes and other irregularities. The local rims, however, are rough and irregular and there is considerable fracturing and shearing in evidence. At more or less regular intervals pronounced fracturing

. . .

occurs in a direction normal to the course of the channel. Along these shear lines the rock is soft and badly broken and disintegrates readily. These lines of weakness form excellent auxiliary ground sluices or tributaries to the main sluices since they require very little blasting to deepen them. These ground sluices can often be established by water action alone. In the channel gutters the rock is not deeply creviced but on the rims where the fracturing and plucking have occurred the rock has been opened sufficiently to make crevicing a necessary part of the cleaning up process. With local exceptions the crevices are not deep and since the rock disintegrates readily when exposed to air and water any gold which may remain in the crevices after one clean-up will be recovered at the next.

CONDITIONS AFFECTING MINING: (Ref. Maps 1, 2 and 3. Photos 1 to 11).

1. Water Supply. (See "Estimates #4, Construction Costs").

With all other basic essentials satisfactory, the production of an hydraulic gold mine is, up to the governing limit of operations, progressively proportional to the amount of water which may be applied at the pit faces, and the effective head under which this water may be so delivered.

The water supply as proposed for the Moorehead Mine depends upon the run-off from those drainage areas not held by other interests, and which are naturally, or which can be made tributary to the property by means of a proposed gravity system. These areas include the watersheds of Long Lake, Little Lake, Little Lake Creek, Moorehead Creek below Moorehead Lake, Warren Creek and Lake, Anderson Lake, Jackpine Lake, 8-Mile Lake, 8-Mile Creek, 6-Mile Creek, 5-Mile Creek, 4-Mile Creek, Cub Lake and Gavin Lake. This entire watershed totals over 60 square miles in area.

Meteorological observations conducted in this vicinity indicate a mean annual precipitation of 27 inches. The annual run-off, while in general proportional to the precipitation, is influenced by a number of local factors which cause considerable variation. It is believed, however, that on the average, at least 55% of the precipitation on the drainage areas available may be conserved and delivered to the property; this, if adequately controlled by suitable storage reservoirs will provide an average of 2000 Miners' Inches of water for 180 24-hour working days of each season. This amount of water

equal to a water supply of 56 second feet, on the basis of 35.7 B. C. Miners' Inches being equal to one second foot flow. To follow recognized practice, the reference and data is expressed mainly in second feet for water flow or run-off per square mile, and in acre feet for storage, the relation of one to the other being indicated clearly; thus one second foot, or 35.7 B. C. Miners' Inches flow for a period of one month is equivalent to 60 acre feet of water. The flow of 56 second feet, or 2000 Miner's Inches for a period of six months is equal to an accumulated storage of 3360 acre feet per month or 20,160 acre feet of water in six months. This water may be delivered to the pits under a net effective head of 450 feet.

The Government records of temperature, precipitation and stream flow for the Quesnel and Barkerville districts have been fairly complete over a period of years, probably on account of the importance and position these districts have held in placer mining since the early development of mining in the Cariboo Country.

Referring now to the topographical map of the drainage area available for a water supply to the Moorehead Mine, this drainage area is lettered in respective sections and so listed in the following table with areas and estimated run-off.

		Areas Acres	Areas Sq. Miles	Run-off At 1.1 sec. ft. per sq. mi. Sec. Ft.	Acre Ft.
1.	A	780	1.22	1.34	965
	C	1340	2.09	2.30	1680
	E	653	1.02	1.12	805
	F	658	1.08	1.19	855
	H	5570	8.70	9.53	6880
	I	3130	4.90	5.38	3870
	J	7792	12.13	13.34	9620
		19,923	31.14	34.80	24,675
2.	K	3,510	5.48	6.03	4,340
3.	L	15,370	24.01	26.37	19,100
Total		38,803	60.63	66.60	48,115

From the above list, it is noted that the drainage area available for water supply has a total of 60.63 sq. miles and is divided into three groups, according to the respective problems of control or storage.

The mean elevation is taken as 3300 feet, and the precipitation

precipitation of 27 inches with run-off factor of 55%. The run-off would therefore be 14.85 inches per year, the balance of precipitation being lost by evaporation and percolation.

A run-off of 14.85 inches or 1.238 feet gives a total run-off of [illegible] gives 38,803 acres or 48,115 acre feet of water and taking 60 acre feet per month or 720 feet per year as equal to a flow of 1 sec. ft. the estimated mean flow from the drainage area is 66.6 second feet or [illegible] ft. per square mile over the area of 60.63 sq. miles.

Referring now to the Government records of stream flow from the North and South Forks of the Quesnel River as given complete for 1927 and [illegible]

The actual run-off per square mile from the North Fork was 2.71 sec. ft. for 1927 and 3.68 sec. ft. for 1928 or a mean of 3.2 sec. feet per square mile.

Actual run-off per square mile from the South Fork was 1.38 sec. ft. for 1927 and 2.08 sec. ft. for 1928 or a mean of 1.73 sec. ft. per sq. mile.

Evidently the precipitation is heavier on the North Fork area, as also suggested by the Barkerville Records and on the basis of a 55% run-off factor, the precipitation in the South Fork area should average [illegible] inches, so that the estimated amount of 27 inches precipitation for the Moorehead Mine drainage area should be about right, having also in mind the recorded precipitation of 24 inches over the ten year period [illegible].

o o o

A large percentage of the total run-off is derived from the melting snows and the spring rains. At this season of the year all the creeks become swollen and continue at this stage of water until the snow has disappeared. It is obvious that to attain maximum efficiency, the surplus water must be stored and brought onto the property as needed. The hydraulic problem, therefore, resolves itself into the construction of such a system of ditches, flumes, dams and storage reservoirs, as will render this condition possible.

Dist. data if More load lake water is now available

Proposed Water Control.

Dealing now, therefore, with the amount of water for the Moorehead on the basis of 1.1 sec. ft. run-off per square mile, the total run-off [illegible] sq. mi. would be 66.7 second feet as a mean for 12 months and this is equal to 48,115 acre feet of water.

Of this amount, 19100 acre feet comes from area L and can be stored in 8-Mile Lake; 4340 acre feet comes from area K, and can be stored in 8-Mile Lake; the balance is the run-off from area A-J and amounts to 24,700 acre feet of which about 14,600 acre feet can be used or controlled for mining [illegible] 10,100 acre feet cannot be used or controlled.

Thus 38,015 acre feet of water from the total areas concerned is available for mining operations, and is equivalent to a mean flow of 105 second feet for six months or nearly double the 56 second feet proposed.

Since 56 second feet is equal to 28,160 acre feet in six months it is proposed to allow a 40% margin to cover any dry season and allow for water losses of the system, so that the water system should be planned for [illegible],200 acre feet of water control, and this is equal to a mean flow of 78.3 second feet for six months, and 24 hour service.

o o o

It is therefore proposed to provide at this time for water control of 17,000 feet instead of full capacity of 38,015 acre feet to avoid unnecessary expenditure for full capacity dams.

A 12 foot dam on 8-Mile Lake would provide storage for 2450 acre feet, a 23 foot dam on 3-Mile Lake would control about 6400 acre feet and a [illegible] foot dam on Little Lake would control about 1550 acre feet, a total of [illegible],400 acre feet of the 17,000 acre feet storage required. The remaining [illegible] acre feet could be controlled in Long, Warran, Jackpine, Anderson, Gavin and Cub Lakes in the ratio of about 1000 acre feet to the Lake, with the exception of Warran Lake which would control about 1600 acre feet.

Deducting 17,000 acre feet from 28,200 acre feet leaves a balance of [illegible],200 acre feet of water which would be delivered into the water system by free run-off of area (A-J) including 56 sec. ft. of flood flow from April [illegible] about June 1st, after which the storage waters above noted would be drawn [illegible] to supplement the reduced flow from this area up to the end of the operating

o o o

October 10th.

Detail surveys have been made and maps, plans, estimates and specifications for the development of this area by means of such a system have been prepared. In brief, the proposal calls for the following: The construction as mentioned above of four major retaining dams at the outlets of Little Lake, 8-Mile Lake, 3-Mile Lake and at the junction of Warran and Moorehead Creeks, including Warran Lake so that these lakes and the last named location may be used as storage reservoirs. Of these proposed major dams, that at the outlet of Little Lake was completed in 1931. It is proposed that the Warran Lake location be used as the main pooling reservoir and with this in view all the water from the entire 8-Mile - 3-Mile watershed area is to be made tributary to Warran Creek reservoir by means of flumes, open ditches and by the use of natural water courses. From Warran Creek Reservoir it is proposed to convey the water as required through a high level flume of 2000 Miners' Inches (56 c. f. s.) maximum capacity, to the mine, at which point it may be delivered under a head of 450 feet. This latter will be referred to as the "High Level System."

The 3-Mile - 8-Mile ditch will start at the outlet of Cub Lake at which point it will drain the storage from Cub, 3-Mile and Gavin Lakes, 3-Mile Lake being the main body of storage for the entire system. At its start the capacity of the ditch is to be 2000 Miners' Inches (56 c. f. s.) but after picking up 4-Mile, 5-Mile and 6-Mile Creeks enroute, the capacity is to be increased to 2500 Miners' Inches (70 c. f. s.). At 8-Mile Creek, which together with the storage of 8-Mile Lake will also be picked up enroute, it is proposed to still further increase the capacity to 3000 Miners' Inches (84 c. f. s.). This ditch is to be carried over the Warran Creek summit and discharge into the headwaters of Warran Creek, down which it will flow to the proposed site of the Warran Creek Pooling Reservoir which will be located near the junction of the creek with Moorehead Creek, at which point the water will be stored and diverted. Here its quantity will be increased by the water from the Warran Creek watershed, including Anderson Lake and by the surplus in Moorehead Creek below Moorehead Lake Dam. From the point of storage and diversion near the confluence of the two creeks mentioned above, it is proposed to construct a flume of 2000 Miners' Inches (56 c. f. s.) which will lead directly along the west side of Moorehead Creek above the canyon to a point immediately above the pits; thence it will be

conveyed and delivered to the pits through a pipe line and monitors under the head above mentioned.

The water from the Little Lake - Long Lake drainage areas is now being stored in Little Lake and thence allowed to run down Little Lake Creek as required to a point just below the confluence of this creek with Moosehead Creek. At this point it is diverted and conveyed through about 1000 feet of flume and ditch having a capacity of 2000 M. I. (56 c. f. s.) to a point near the pits to which it may be delivered through a pipe line under a head of approximately 110 feet. This system will be referred to as the "Low Level System" and was completed in 1931. With very little expense, it may be increased to a 3000 M. I. (84 c. f. s.) capacity.

The above described major storage reservoirs when completed will control about 12,000 acre feet of water, but adequate control of the run-off required a minimum of 17,000 acre feet. To store the remaining 5,000 acre feet it is therefore proposed to make use of the five smaller tributary lakes known as Long, Jackpine, Anderson, Cub and Gavin Lakes in the storage ratio of about 1,000 acre feet to the lake. To obtain this storage capacity on these lakes, the dams required will be small and inexpensive and represent but a relatively small proportion of the total storage cost.

The advantages of the double system are obvious. The High Level System may be used almost entirely for cutting and caving the high banks, the Low Level System may be used entirely for sluicing and under a maximum degree of efficiency once the material from the banks has been safely caved by means of a higher head of water. Secondly, while the water from the Little Lake - Long Lake area cannot be put through the High Level System, the water from all remaining areas, representing over 90% of the total watershed, can be put through either system, thus affording absolute regulation of both quantity and head of water for any given combination of mining conditions which may be met with. Thirdly, by the use of both systems a maximum capacity of 5000 M. I. (140 c. f. s.) will be obtained. This will make it possible to utilize for mining purposes, the peak run-off, which otherwise would be lost. Efficiency and capacity of the plant will therefore be proportionately increased. From a construction and development standpoint, the most striking feature of the entire proposal is perhaps the fact that the entire watershed area, amounting to over 60 square miles in extent, may be made tributary to

the mine with a total of only 10½ miles of ditch and flume and furthermore over 90% of the available run-off from this extensive area may be delivered at the pits under a head of 450 feet. This favorable combination of conditions as regards availability of watershed areas is one rarely encountered in the development of an hydraulic mine.

From the standpoint of early production a feature of particular merit and interest is that of the certainty of productive operations during the first construction season and the possibility of increasing that production to full capacity by the following season. This plan may be executed as outlined under "Recommendations."

The first stage of construction for the High Level Hydraulic System provides for the development of 8-Mile Lake and tributary watershed areas and the conveyance and delivery of this water as well as that of the Warran Creek areas through about 2 miles of flume to a point above the pits to which it would be delivered through a pipe line under a net effective head of 450 feet. Any part or portion of the water derived from these areas might also be delivered through the Low Level System as required. This construction should also include initial sluice tunnel, sluice and raise, compressor plant, lighting and telephone systems, permanent camp construction, etc. By completion of this work about one half of the available draining areas would be developed under both high and low pressure systems and some production assured during the latter part of the first season.

The second stage of High Level System construction provides for the development of the 3-Mile Lake area and the delivery of its water to the mine through either high or low level hydraulic systems or both; it also provides for the construction of the storage dam for Warran Creek Pooling Reservoir and the construction of the small storage dams on Long, Anderson, Gavin and Jackpine Lakes. This would complete the proposed plan of development and bring the mine into full maximum production as outlined.

As previously stated, the Low Level Hydraulic System has practically been completed and has already been operated. To complete the High Level Hydraulic System would normally take two years but with all the facilities available the work could be accomplished in one year.

Providing future developments warrant the outlay, there are other possible sources of water supply which may be brought on to the property, any one of which would be equal to if not greater than the one contemplated. Consideration of these projects, however, are matters entirely for the future. For the present purposes, the water supply proposed in this report is quite adequate and at the same time the most efficient and economical.

Procedure in the use and storage of the water would be as follows. As soon as the lakes and reservoirs were emptied in the fall of the year, all the gates would be closed, and kept closed until after the subsidence of the freshet caused by the melting snow in the following spring at which time, depending upon winter precipitation, all the lakes would be full or nearly so. Active hydraulic operations would be started as soon as the spring freshet assumed sufficient proportions and carried on peak run-off which it would be impossible to store. In average seasons, therefore, the close of the spring freshet would find all the lakes full and to be drawn from as needed for the balance of the season. Under average conditions this would insure a 180 twenty-four-hour day operating season at a capacity of 2000 M. I. (56 c. f. s.) of water deliverable at the mine under a net effective head of 450 feet for the High Level System and 110 feet for the Low Level System. In actual practice the quantity of water used for hydraulicking would be 3000 M. I. (84 c. f. s.) since this practice would increase the duty of the water and allow time for repairs and other emergency situations.

The relative positions of the watersheds are such that the lower levels only would be directly tributary to the ditches without the water first passing through intermediate storage. The high, heavily timbered plateaus and peaks on which the snow falls deep and stays late in the spring, are for the greater part directly tributary to Cub, 3-Mile, Gavin, 8-Mile Anderson, and Jackpine Lakes, all of which are at an elevation exceeding 3000 feet above sea level. This means, in general, that the spring run-off of the lower levels will be well along before that of the higher levels starts, consequently in seasons of excessive precipitation there will be no necessity for wasting water by reason of insufficient storage capacity, the ditches by that time being capable of accommodating any such excess. In such years, therefore, the operating seasons would be correspondingly lengthened.

These figures check substantially with the topo maps

2. Sluice Grade and Tailings Dump.

The elevation of channel bedrock above Moorehead Creek and the valley of the Quesnel River, affords a natural dump of from 35 to 100 feet for the lower 2000 feet of ground extending along the said creek. This creek has an average grade of 4.2% from the falls downstream a distance of 3800 feet, so that no difficulties in the disposal of tailings would be encountered throughout that length. For the ground farther up the creek, however, the relative positions of creek and channel require that careful and thorough consideration be given to the method of future operations to follow the working out of the lower 2000 feet of ground. While no prohibitive difficulties will be encountered in mining the ground covered by the leases farther up-stream, providing due consideration is given to governing conditions, it is recognized that these conditions must be considered long in advance of the operations, in order that gravel which might be very valuable would not otherwise be lost to future development.

It has been stated under a previous heading that the extent of channel gravel which may be removed by ordinary hydraulic mining methods will be governed by the bedrock grade of the old channel. Moorehead Creek, from the point where sluice diversion to the Quesnel River would eventually be made, on up-stream through the leases to its confluence with Little Lake Creek, has an average grade of 5%. It has been impossible to determine enough significant points of bedrock elevation in the old channel to exactly establish the grade of the ancient river except within the limits previously given. These points were, however, about 40 feet higher than Moorehead Creek. Since it is improbable that the old river had a grade as steep as the present creek, it is obvious that a point will be reached, in carrying hydraulic operations up the channel, where the two grade lines will intersect. It is also obvious, since the bedrock of the creek is the lowest natural sluice way channel, that such point of intersection will mark the limit of mining operations by ordinary hydraulic methods, unless provisions are made to cut the governing sluice grade to absolute minimum at the start of operations. This would mean the eventual steel paving of the sluices and sluice tunnelling for those operations farther up. This, however, would only require to be done in small stages as the operations proceeded, and could be carried with the operating costs. Such a plan would, no doubt, extend the life of the proper-

many years through the additional probable and possible yardage made available. It should be thoroughly considered before any extensive operations are commenced, in order that the sluice grade available in Moorehead Creek would not be lost by reason of the tailings deposited therein from the earlier stages of operations. (Ref. Map 3).

3. Accessibility, transportation facilities, labor, wages.

The Moorehead Mine lies at an altitude of about 2350 feet. Camp has been established at an elevation of about 2650 feet on a branch of the main road, from Williams Lake to Likely, which passes through the property. Any supplies and equipment necessary for development or operating purposes may be hauled in over this road which connects with the main highway at Hydraulic Post Office, seven miles distant. Williams Lake is the nearest town on the Pacific Great Eastern Railway; being distant from the property by this route, about fifty miles. It is therefore advisable, at this time, to plan on having all supplies and equipment shipped to the latter station. Moreover, Vancouver is the most favorably located of any of the larger outfitting points, and a direct rail shipment to Williams Lake is the most advantageous.

Hydraulic mining, in contradistinction to lode mining, is confronted by none of those often complex and expensive problems of ore transportation. The transportation problem merely resolves itself into that of the one-way haulage of equipment and supplies, and this is the reason it is often possible to operate hydraulic properties successfully at greater distances from rail or water transportation than would be possible by any other method. Transportation to and from this property is by truck and motor car during the operation season, and for the remainder of the year by sleigh or tractor. It may be stated that the property is easily accessible and offers no serious transportation difficulties.

Labor is sufficiently plentiful to equip and operate a large-scale hydraulic property. In comparison with the magnitude of the operations, it requires but few men to operate such a mine once the equipment is installed. Since the construction of the railway into the district, the improvement of motor roads, and the consequent influx of settlers, it is not anticipated that scarcity or quality of labor for hydraulic operations will become a difficulty now or at any future period.

Yuk Yuk!

Wages range from $2.00 to $4.00 per day, plus board and lodging. The [illegible] scale depends upon the class employed and the season of the year [illegible] the work is being carried out.

As mentioned in the preceding paragraphs, the working season is about [illegible] days, and extends from the first of April to the first of October. There [illegible] years in which this might be increased from 30 to 60 days, providing [illegible] water supply for this additional period were available as it undoubtedly would be during years of excessive precipitation.

Supplies of fuel, lumber, power, etc.

The area was originally timbered with fir, spruce, and cedar, but [illegible] cutting and fires, much of this has been removed, so that outside of [illegible] few patches of virgin growth, the forests are largely second-growths of [illegible] spruce, pine and aspen. There still remain, however, outlying areas [illegible] of excellent timber which will meet all demands for fuel, lumber for camp [illegible] flumes, sluices, etc., as well as logs for dams, trestles, or [illegible] construction work necessary. By installing a portable saw mill this [illegible] can be manufactured cheaply and easily on the ground or contracted at a [illegible] reasonable figure. Fir lumber in this vicinity sells for from $20.00 to [illegible] per M. B. F., but could probably be manufactured more economically [illegible] during the winter by the above methods.

cheaper to haul from one of the coal mines

Any power necessary to operate machinery in the pits, or to light [illegible] the pits and camps, may be generated cheaply and easily by the installation [illegible] of auxiliary hydro-electric equipment.

Best bet would be a line from the BC Power proposed Clearwater development

With reference to food supplies, it may be stated that there are a [illegible] number of good ranches in the country, capable of supplying all vegetables, [illegible] hay and dairy supplies. Other supplies may be ordered wholesale from [illegible] Vancouver or purchased directly in Williams Lake.

C. Climatic Conditions.

Meteorological observations indicate a mean annual precipitation for the [illegible] vicinity of 27 inches, fairly evenly distributed throughout the year. [illegible] observations show the mean annual snow fall to be about 85.8 inches, [illegible] distributed as follows: Oct. 1.0"; Nov. 14.3"; Dec. 17.7"; Jan. 20.7"; [illegible] 17.2"; Mar. 9.4"; Apr. 4.1"; May 0.5". The maximum recorded was in

fell.

Similar observations as to temperature show a mean annual temperature of [illegible] degrees apportioned as follows: Jan. 20.2; Feb. 21.1; March [illegible]; May 49.1; June 55.1; July 59.5; Aug. 57.9; Oct. 41.6; Nov. 3[illegible]

AND COSTS OF PROSPECTING AND MINING. (Ref. Maps 2, 3; Photos 5 -

1. Prospecting.

In exploring the average alluvial deposit, the principal information sought is the total yardage available and the average value per cubic yard. Often of no less importance are the actual channel locations and the exact grades of their bedrock. The four methods commonly used in the exploration of alluvials are shaft sinking, drifting, drilling and piping tests.

Of the above four methods, shaft sinking may, in the case of the Moorehead deposits, definitely be excluded on the grounds of excessive depth of deposit and attendant expense incommensurate with the results obtained. For the above reasons, together with the proven nature of a large section of the Moorehead gravels, drilling may, except for determination of certain bedrock elevations, also be definitely excluded. The drifting method has been used to some extent on the property and might be used again for bedrock testing of the unexplored ground. Piping has been carried on extensively and the results of this work, which may be considered as most reliable tests, together with the sampling of the gravel faces so made available, leave little to be desired insofar as that section of channel considered as proven ground is concerned.

Drilling should not be completely ruled out by experience here

NOT BACKED up by FACTS. Weber says no evidence of large boulders (?) Note page 33 (d) para

It has been shown in preceding paragraphs and can be demonstrated on the ground that the old river channel system definitely exists; that it traverses through the property; that it has been cut in cross-section in three distinct places by natural agencies; that at each point of cutting the values in the reconcentrated gravels prove that the channel carries commercial quantities of gold. At a fourth point, hydraulic mining operations have not only proven the existence of the channel and that its gravels can be mined at a profit. Surveys and estimates indicate that there is sufficient of this gravel to justify initial costs of hydraulic development and return a profit.

More important than the paragraph is the fact that Weber & Jacobi hope to get gold from several pents over 1.5 mile length on the claims

and interest. In addition, there is the probability of a large ... from the partially proven ground farther up the channel, and indicat... a further immense yardage from the unproven ground on the north side ... Moorehead Creek and on up Little Lake valley and Moorehead Creek Canyon. ... this ground, both drifting and drilling methods can undoubtedly be used to ... advantage for future prospecting, appropriations for which may be made ... operating profits. The channel ground on the south side of the creek, ... may be considered as sufficiently proven to justify the development progra... proposed and further exploration expenditures at this time, except for ... location of channel bedrock elevations, are not considered necessary.

Not proven but this is outside the 18000000 yds

E. Mining

In mining this deposit the only practical method to be considered ... at the present time is that of hydraulicking. As stated under "Water Supply" ... sufficient quantity of water may be delivered at the property to insure ... large scale hydraulic mining operations throughout six months of the year. ... This water, which would be brought to suitable points above the pits by means ... of both the High and Low Level Systems, would, at these respective points ... be delivered into lines running directly to the pits. Here it would be delivered ... against the gravel faces under heads varying from 450 to 110 feet, depending ... upon conditions encountered and the heads employed. From the pit faces ... the water with its added load of gravel would pass through the usual sluices ... and other gold saving devices to the tailings dump, eventually emptying into ... the Quesnel River.

Berber agrees estimate Cost 0.12/yd

The surface of a great part of the ground to be hydraulicked is ... covered by second growth fir, spruce, jackpine and aspen. This should be ... removed in advance of operations, and any of the timber which could be used ... for fuel or construction purposes, saved; the remainder should be burned.

There are found on or near bedrock in the deposits, some boulders ... too large to pass through the sluices. There are also others which could ... pass through but which it is not good practice to so allow. By the installa... of rock drills and a portable air compressor in the pits, these boulders may ... be disposed of more cheaply than they might otherwise be handled.

These should be checked

The nature of the deposit is such that it may be attacked at several ... different points. In the preliminary testing operations it has been found

possible to start in the upper pit and remove all the material possible by sluices built into cuts through the north rim. For future operations, however, the sluice tunnel should be started from a point farther down the creek at a lower elevation and extended to a point beneath and to the north of the channel bedrock exposed by the above operations. Lateral sluices, drifts and raises connecting the main sluice tunnel with the present sluices at other strategic points would then supply sluice grade for the material to be hydraulicked. As hydraulic operations proceed, the sluice tunnel may be extended to keep pace with the operations. This work could probably be done most cheaply by contract during the winter months and the costs charged against operating expenses.

Hydraulic operations under the plan proposed are based on the assumption that the drainage areas available will provide an average of 2000 Miners' Inches [50 c. f. s.] per day over a period of 180 twenty-four hour days; this is the equivalent of 360,000 M. I. per year. In hydraulic mining the duty of water under certain given conditions increases progressively up to the governing limit of operations, with the quantity of water used. When a limited quantity of water is available it will therefore materially increase the duty to practice the so-called "Pooling system." This, in construction, consists in increasing the capacities of the main ditch, pipe line and sluices over and above the average daily water supply, and, in operation, of holding up or "pooling" the water available for a sufficient time each day, so that the water so accumulated will be sufficient to operate the mine at the increased capacity for the remainder of the time.

As applied to the Moorehead Mine, this system would work out as follows: With a maximum capacity of 2000 M. I. for a 24 hour day, it is doubtful if the duty of the water under the given conditions would exceed 3 to 1. With a total supply of 360,000 M. I. available this would result in a total yardage moved per annum of 1,080,000. By increasing the quantity of water used to 3000 M. I. for a 24 hour day. However, it is estimated that the duty would be increased to an average of about 4½ to 1, resulting in an annual yardage moved of 1,620,000 cu. yds. An increase in yardage and profits of about 50%. The added first cost and cost of operation would be slight in comparison to the results obtained; also a certain number of hours in each day would be available for blasting and repairs. Operating costs under this system, including all overhead, should not exceed 7¢ per cub. yd.

Separation of Valuable Minerals.

In the first operations conducted by the early miners on Moorehead Creek, the gold was recovered entirely by rocking and panning. The Chinese who followed these miners, installed a small ditch system and piped the run of creek with a canvas hose, saving the gold by means of small sluice boxes equipped with riffles. When the Moorehead Mining Company, Ltd., took over the property, they installed the usual gold saving devices. These consisted of two sluice boxes paved with block riffles and built on 5% grade.

It is definitely known that the concentrates from this deposit carry appreciable values in gold, coarse and fine platinum, and the metals of the platinum group. Nuggets of native copper containing both gold and silver are numerous, while cinnabar and other sulphides of the metals are also present. While the copper and sulphides may not be of any commercial value, the fine gold and the platinoids unquestionably are, and these values could and should be recovered in any future operations on the property.

Extensive tests carried out by the writer, with the collaboration and assistance of Dr. Seyer and Dr. Stedman of the Department of Chemistry, University of British Columbia, indicate fine gold and platinum values contained in the concentrates from the Moorehead deposits of about 4~~gr~~ per cubic yard of gravel at the present prices of these metals. @ $ 28 /oz for platinum
0.14 /yd @ 90 /oz platinum

It is not considered that any appreciable difficulty need be experienced in the recovery of the fine gold or of a valuable, marketable, platinum concentrate. The installation of suitable riffles and undercurrents, and the application of modern mining and metallurgical principles to the problem, should enable future operators of this property to materially increase the former recovery.

1. SAMPLING AND TESTS.

Gold produced to date - 1768 ounces

Average fineness approximately - 835.

Value at $20.67 per oz. fine - - - - - - - - - - -$30,514.70

Value at $34.00 per oz. fine - - - - - - - - - - -$50,193.52

Area of Bedrock cleaned - - - - - - - -59,000 Square feet

Average depth of gravel superimposed on area of cleaned bedrock, approximately- - - - - - - - - 54 feet

Total superimposed yardage on bedrock cleaned, approximately - 118,000 cub. yds.

Average value per cu. yd. @ $20.67 per oz. fine, based on ratio of total production to superimposed yardage - - - - - - - - - - - - - - - - - 25-4/5¢

Average value per cu. yd. @ $34.00 per oz. fine based on ratio of total production to superimposed yardage - - - - - - - - - - - - - - - - - 42-1/2¢

These tests are based on Annes figures measurements of area mined. If 153 sq ft used Average value is 0.37/cuyd

2. Sampling by Erle C. Annes.

This is the one section tested by Annes

One complete section trench 1 x 2.4 feet taken in pit faces from surface to bedrock, a vertical distance of 150 feet.

For purposes of classification this section was divided into two 75 feet sections, the upper one representing the lean overburden and the lower the richer pay gravels. Each section trench yielded 6 cu. yds. of gravel in place and each 6 cu. yd. quantity was separately put through a small sluice box. After the sluice box run, the content of the riffles was put through a rocker and the content of the rocker then panned. The results were as follows:

Upper 75 ft. - Gold .435 g. - .0140 oz. - fineness .835 = $0.24

Lower 75 ft. - " 4.323 g. - .139 " " " = $2.40

Total yardage - 12 cu. yds. $2.64

$\frac{2.64}{12}$ = $0.22 per cu. yd. as an average value of gravel at this section, based on the old standard price of gold at $20.67 per oz. fine. On the present price of $34.00 per oz. fine, the average value per cu. yd. of gravel at this section is $0.36 plus.

Owing to the inaccessible nature of the pit faces it was not ... to take the above section in a continuous vertical line. For this ... five different sections, of which none overlapped stratigraphically, ... were taken at accessible locations in the upper pit. Three of these sections ... a total of 75 feet, vertical distance, and yielding 6 cu. yds. of gravel ... represented the overburden, and the two remaining sections, totalling 75 vertical ... and yielding a like yardage, represented the lower pay gravels. Average ... value of the ground assumed on the basis of the above sampling was 22¢ per cu. ... at the old standard gold price of $20.67 per oz. fine. On the present ... of $34.00 per oz. fine, the average value of the ground is taken at 36¢ ... per cu. yd.

CONCENTRATES.

1. (a). Coarse, crude platinum separated by hand from the various runs ... oz. of 60% platinum content.

(b). A mocroscopical analysis of 33.19 g. of sluice box concentrate ... yielded .595 g. of 60% Pt. This is in the proportion of 303 ounces of pure Pt. ... to the ton of concentrates. With Pt. at $28.00 per oz. net, the value per ton ... of this grade of concentrate would be $8,484.00.

(c). The 12 cu. yds. of gravel taken and treated as described under ... "Gold Sampling," yielded 53.62 g. of concentrate; this when assayed by W. F. ... Hover, Associate Professor of Chemistry, University of British Columbia, gave ... 1.1% Pt. These tests indicated the presence of black and gray sand in the ... ratio of 2 lbs. to the cubic yard of gravel. Of this, 50% or 1 lb. per cu. ... yd. was eliminated by sluicing. The remaining 12 lbs. when concentrated in ... the ratio of approximately 100 into 1, gave the 53.62 g. of 1.1% platinum con- ... centrate referred to above. With platinum at $28.00 per oz. net, this concen- ... trate would have a value of $8,960.00 per ton. On the above basis, the indicated ... platinum value per cubic yard of gravel would be about 4½¢.

(d) Sluice box tests for platinum and gold concentrates.

The number of days piped was 12, and the number of cubic yards of gravel ... piped was 9,100, and the gold bullion produced from cleaning up the upper 250 ... feet of sluice box had a value of $1,183.19.

The remaining lower 250 feet of sluice box was cleaned for testing pur- ... poses. This yielded 2.99 oz. of gold of which (a) 1.5 oz. were recovered by the ... usual methods and the remaining (b) 1.49 oz. was recovered from the concentrates ... by means of rocking, panning and amalgamation. This gold had a fineness of 800

...oz. of $16.61, on the old basis.

... x $16.61 = $24.91

$\frac{24.9}{1,15}$ = .02 or the ratio of gold recovery was therefore

...% recovered in upper 250 feet of sluice.

...% recovered in lower 250 feet of sluice.

500 lbs. of black sand concentrate was recovered from the lower 250 feet of sluice in these tests. This yielded 4.99 g. of platinum. By the above ratio, the platinum recovery from the upper 250 feet of sluice would be in the following proportion:

$\frac{2\%}{.00} = \frac{4.99}{x}$ x = 249.5 g., $\frac{249.5\ g}{31.1034}$ = 8 oz. plus.

Assuming platinum @ $28.00 per noz., 8 x $28.00 = $244.00

$\frac{\$244.00}{9100\ \text{cu. yds.}}$ = approx. 2-3/5¢ in Pt. per cu. yd. of gravel.

The 500 lbs. of concentrate described above yielded 1.98 oz. of T. P. gold. Assuming, on the basis of previous results, double the 500 lbs. of concentrates for the upper 250 feet of sluice, we have 1.98 x 3 = 5.94 oz. T. P. gold for the entire 500 ft. of sluice. The gold average, therefore, of the concentrates, per cu. yd. of gravel, would be

$\frac{2.\ 8 \times 5.94}{9100}$ = 0.01-1/3 at the former standard gold prices and 2-1/5¢ at the present prices. Average value in concentrates per cu. yd. of gravels - ...02-3/5¢.

...value in concentrates per cu. yd. of gravels = Au. .02-1/5.

...platinum and gold = .04-4/5¢.

NOTE:

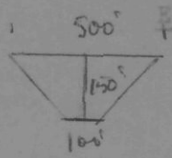
Any of these additional values which may be contained in the gravels and recovered in the form of concentrates are not included in the estimated value of 36¢ per cu. yd. on which the average of the gravels is based.

Map 3).

Values based upon results as given under "Sampling and Tests").

Considered as proven yardage.

Average $\frac{500' \times 150' \times 2/3}{9}$ x-sections



	Estimated Yardage	Value	Measured Length	Sub-Total
A-A to B-B	500,000	$ 180,000	100'	
B-B to C-C	1,000,000	360,000	200	
C-C to D-D	1,250,000	450,000	250	
D-D to E-E	1,550,000	558,000	310	
E-E to F-F	2,030,000	730,800	406	
F-F to G-G	2,240,000	806,400	448	
G-G to H-H	2,130,000	766,800	426	
H-H to I-I	1,580,000	568,800	316	
I-I to K-K	6,000,000	2,160,000	1200	
	18,280,000	6,580,800	3656	
	18,280,000			$6,580,800

Considered as indicated yardage.

That ground on the north side of Moorehead (Peak indicated by early exploration work.)	20,000,000	7,200,000	
That ground up Little Valley not included in the above estimates.	10,000,000	3,600,000	
	30,000,000	10,800,000	
	30,000,000		10,800,000
	48,280,000		

Considered as a possibility

Concentrates, gold and platinum, Yardage, from 48,280,000 Cu. Yds. Value @ 4½¢ per cu. yd. 2,172,600

GRAND TOTAL $19,553,400

NOTE.

It will be noted that the estimated values per cubic yard are based on the results of actual runs and on the sampling of the exposed gravel faces, and do not include any values based on the concentrates, it being considered that the mine will have to stand on the basis of values recoverable by ordinary methods. The sampling and tests on the concentrates indicate possible additional values of about 4½¢ per cubic yard of gravel and much is to be hoped from the recovery of these values. For purposes of valuation, however, it is thought best to disregard these results and treat them as a possibility only, rather than as a proven certainty.

CONSTRUCTION COSTS.

Low Level Hydraulic System.

Enlarging to 3000 M. I. (84 c. f. s.) capacity.

1000 ft. #96 metal flume @ $3.00	$3,000.00	
Long Lake Storage Dam	1,000.00	$4,000.00

High Level Hydraulic System.

(8-Mile Lake - Warran Creek Ditch Section).

800 ft. of metal flume, #120, @ $5.00	4,000.00	
6940 ft. of ditch , 3000 M. I. Cap. (56 c. f. s.) including Warran Creek cut.		
28,600 cu. yds. @ approx. 35¢	10,000.00	
Clearing Right of Way, 8 acres @ $100	800.00	
8-Mile Lake Storage Dam	2,200.00	17,000.00

(Moorehead Creek High Line)

Diversion Dam	500.00	
12,000 ft. #60 Metal Flume @ $2.00	24,000.00	
1 Pressure Box	500.00	
Pipe Line, 3,000 ft. @ $5.00	15,000.00	
3 Gate Valves @ $500	1,500.00	41,500.00

(Pit Construction & Equipment).

300 ft. sluice tunnel @ $20.00	6,000.00	
100 ft. of raise @ $20.00	2,000.00	
1000 ft. of sluice @ $5.00	5,000.00	
Compressor & drilling equipment	2,500.00	15,500.00

(Camp & Miscellaneous).

Lighting Plant	5,000.00	
Tel. & signal system	2,000.00	
Camp	10,000.00	
Automotive Equipment	3,000.00	
Drilling	1,000.00	21,000.00

(3-Mile Lake Section --
Total Length 37,330 feet).

8,335 ft. #96 metal flume @ $3.00	25,000.00	
29,203 ft. Ditch, 2,000 M. I. Cap. (56 c. f. s.) approx. 50,000 Cu. Yds. @ 35¢	17,500.00	
Flume trestles, 1000 ft. @ $5.00	5,000.00	
Clearing right of way and damsites Approx. 50 acres @ $100.00	5,000.00	52,000.00

Dams

3-Mile Lake Storage Dam, 6,600 Cu. Yds. @ $1.25	7,250.00	
Cub Lake Storage Dam, 2,500 Cu. Yds. @ $1.25	3,125.00	
Pipes, Gates & Fixtures	4,625.00	15,000.00

Other Storage Dams

Warren Lake, 20,000 Cu. Yds. @ $1.50	$30,000.00	
Anderson Lake	1,000.00	
Gavin Lake	1,000.00	
Jackpine Lake	2,000.00	34,000.00
Engineering & Contingencies	30,000.00	
Gen. Management & Overhead	20,000.00	50,000.00
GRAND TOTAL		$250,000.00

FINAL ANALYSIS

Value of gold taken at $34.00 per oz. fine.

Value per Cu. Yd. on above basis - 36¢ $\left(\frac{32+340}{2}\right)$ 0.34/cu yd

	Yrs.	Yardage	Oper. Costs	Gross Return	Gov't. Royalties	Profits
1. On basis of proven yardage, 12 years at full production.	12	18,280,000	$1,279,600	$6,580,800	$131,266	$5,169,934
2. On basis of indicated yardage, 18 additional years at full production.	18	30,000,000	2,100,000	10,800,000	216,000	8,484,000
3. On basis of possible returns from concentrates, 30 years of concurrent operations.	30	48,280,000	241,400	2,172,600	43,452	1,887,748
4. Total of proven, indicated and possible returns at full production for 30 years.	30	48,280,000	$3,621,000	$19,553,400	$390,718	$15,541,682