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REPORT ON THE
GEM PROPERTY
BRIDGE RIVER, B.C.

By

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July 1955

CONTENTS

	<u>Page</u>
Introduction	1
Topography	2
Mineral Claims	3
History	4
Geology	5
Introduction	5
Stratigraphy	5
Structure	5
Mineralogy	6
Surface Showings	6
Underground Workings	7
Lower Tunnel	7
Upper Tunnel	8
Diamond Drilling	8
Sampling and Assays	9
Indicated Tonnage	15
Development Possibilities	17
Metallurgy	18
Economic Considerations	19
Camp, Timber, Water and Power	22
Conclusions	23
Recommendations	24
Maps	
Bibliography	

THE GEM PROPERTY
BRIDGE RIVER, B. C.

INTRODUCTION

The Little Gem property was examined by the writer, accompanied by Mr. W.W. O'Keeffe and Mr. A. Stonehouse, July 10 and July 11, 1955.

The purpose of the examination was to make a preliminary examination of the general geology, high-grade mineral showings, check on a suitable campsite, and road conditions. This was done and three groups of mineral claims staked around the Crown Granted Little Gem group. Some of the newly staked claims will overly claims already staked and held in good standing, particularly on the west side of Roxy Creek, but any open ground whatsoever has been acquired.

This preliminary report is therefore based upon personal examination by the writer, along with a large amount of data supplied by Government and private reports. A wealth of metallurgical test data is available, and although only touched on briefly in this report, will be available to any interested parties.

The branch road to Tyhauton Creek leaves the Bridge River highway about 4 miles north of Goldbridge. The upper 12 miles of road is in places impassable because of small mud and rock slides, and the writer's party travelled over this on horseback. The top 3 miles, from the Gun Creek bridge to the campsite, is steep, has many switchbacks, and is a 4-wheel-drive truck road. The entire road may, however, be re-opened, and cheaply, with a bulldozer.

TOPOGRAPHY

The property, located near the headwaters of Roxy and Jewell Creeks, lies in a ruggedly mountainous terrain. From the Bridge River highway at approximately 2400 feet elevation above sea level, the road climbs to 3440 feet elevation where it crosses Gun Creek, a distance of 12 miles. The next three miles of road climbs to 2160 feet to the camp on the east bank of Roxy Creek at 5600 feet above sea level. From the camp, the trail, partly bulldozed, follows a series of switchbacks to the lower adit tunnel portal at elevation 6192 feet on a steep rocky sidehill. The upper tunnel portal is at elevation 6250 feet, and the mineralized zone extends on upwards easterly to the top of the narrow ridge at elevation 6650 feet above sea level.

Roxy, Jewell, and other tributary creeks flow in narrow V-shaped valleys northerly into the similarly fast flowing Gun Creek.

Many of the peaks in the immediate vicinity exceed 8,000 feet elevation.

Timber line is between 6,000 and 7,000 feet elevation in this area, being close to the former in Roxy Creek basin.

Slides extend down the steep-walled valley of Roxy Creek, and are a problem requiring attention during the spring season.

MINERAL CLAIMS

The Gem property comprises Crown Granted and "located" mineral claims as follows:

Crown Granted Mineral Claims:

Little Gem	2	Lot 7566	34.90 acres
"	" 4	Lot 7567	34.49 "
"	" 6	Lot 7568	46.99 "
"	" 11	Lot -	-
"	" 15	Lot 7727	49.87 "
"	" 16	Lot 7728	49.57 "
"	" 17	Lot 7730	51.63 "
"	" 18	Lot 7731	49.14 "

Located Mineral Claims:

Panang	1 - 8	Mineral claims and fractions
Paul	1 - 8	" " " "

With respect to the located claims and fractions, there are claims recorded on and near Roxy Creek, over which some of the Panang and Paul claims extend. The actual ownership of ground in this section of the property will not be known until the claims are surveyed. These are, however, some distance from the Gem showings which are located on Little Gem 4, Little Gem 2, and Little Gem 18 Crown Granted claims.

These mineral claims are shown, as recorded, on British Columbia Department of Mines Mineral Reference Map 21T269, Department of Lands and Forests, Victoria, B.C.

HISTORY

The discoverers of the property were W.H. Ball and William Haylmore. They sold their interests to J.M. and R.R. Taylor in 1937. United States Vanadium Corporation optioned the property in 1938 - 39 and drove the upper tunnel. In 1939 Vanadium Corporation terminated all exploratory work in Canada, including the only partly finished program on the Little Gem. The lower tunnel was driven by the Taylor interests during the following winter. In the autumn of 1940 Bralorne Mines optioned the property and drove the 2 short raises from the lower tunnel workings. In 1952 Estella Mines optioned the property. This company completed the road to the campsite and did a limited amount of diamond drilling from the lower tunnel workings.

Faced with inadequate winter camp arrangements, a due option payment to be made, and lack of sufficient funds in the treasury to carry on with the contemplated development program, Estella Mines relinquished the option in the early winter of 1953. No exploratory work has since been done on the property.

GEOLOGY

Introduction.

Detailed geological mapping has not been done in the vicinity of the Little Gem property. The Gun Lake area, mapped by the Geological Survey, however, lies only several miles to the east, hence there is considerable data available pertaining to the general geology of the region.

Stratigraphy.

The Little Gem deposit occurs in a zone of bleached granodiorite. The bleached zone lies in a tongue of granodiorite about 2000 feet wide and 2-1/2 miles long, which extends from the main body of Gun Creek, south-westerly across the head of Roxy Creek. On the northwest this is flanked by a wide band of serpentine; and volcanic rocks, mostly andesitic, of the Bridge River formation lie to the southeast. Feldspar porphyry dykes up to 25 feet thick occur within the granodiorite on the property.

Structure.

The bleached granodiorite zone lies almost east-west over an exposed length of 700 feet, and a difference in elevation of 450 feet. The western end, where the 2 adit tunnels are located, passes under talus and overburden of Roxy Creek valley, and the east end, over the ridge, passes under overburden. The showings at the west end comprise a group of lenses within the bleached zone which is 40 feet wide and 130 feet long. The ridge showings near the east end are smaller and the zone is narrower. Several sets of carbonated shear and fracture zones cut the country rock, feldspar porphyry dykes and mineralized zones. There is considerable doubt that these are genetically or structurally related to the mineralized

zones. The lense-shaped heavily mineralized zones or shoots lie closely spaced within the bleached zone. It is to be expected that additional similar shoots occur underground within the easterly trending bleached zone.

Mineralogy.

The bleached granodiorite in which occur the lenses of metallic minerals is composed largely of residual orthoclase feldspar, plagioclase feldspar and quartz, along with disseminated arsenopyrites.

The heavily mineralized shoots occur within the bleached granodiorite "like the plums in a pudding", from a few inches wide and a foot long to 7 feet wide and 16 feet long. The metallic minerals are, in order of abundance, danaite (a cobalt bearing variety of arsenopyrite), loellingite, safflorite, arsenopyrite and a little molybdenite in a gangue of coarse-grained allanite, apatite, feldspar, quartz, chlorite, sericite, calcite, and uraninite. On the oxidized surface erythrite, limonite and other secondary minerals impart easily recognizable coloration to the outcrops.

Laboratory study of polished sections demonstrated that the gold is finely disseminated through the danaite, loellingite, safflorite, arsenopyrite, whereas the uraninite is associated with the gangue minerals in minute particles and crystals in dissemination and swarms. In the sections studied by Stevenson the individual particles and crystals of uraninite are approximately 0.01 inch or less in diameter, which is in the realm of -400 mesh size.

SURFACE SHOWINGS

On the Little Gem 4 mineral claim, Crown Grant Lot 7567 two tunnels penetrate the west end of the exposed mineralized zone, at elevations of 6192 feet and 6250 feet above sea level. From the upper adit the bleached and mineralized zone extends north 75 degrees east up the steep

sidehill and over the top of the ridge, 700 feet to the east and 400 feet higher in elevation. About 150 feet west of the lower portal bleached granodiorite contains erythrite stain and samples from it repeatedly assayed 0.30% Co. over a width of 37 feet.¹ Ten feet southerly from the portal of the upper tunnel, immediately above it, and on up to the open cut above and northeast of the portal, lenses or shoots of metallic minerals occur in abundance along with associated coarse-grained gangue minerals.

This zone measures 40 feet wide and 130 feet long. The shoots contain high values in gold, cobalt and uranium. Near the top of the ridge to the east, and 450 higher, open cuts have exposed lenses of massive mineralization a few inches wide and a few feet long, containing unusually high values in gold and uranium. Open pits 300 feet down the east side of the ridge have exposed the zone through 10 feet of overburden.¹

North, a short distance from the open cut above the upper tunnel, high grade cobalt and uranium mineralization occurs along the contact of a feldspar porphyry dyke.

UNDERGROUND WORKINGS

Lower Tunnel.

The portal of the lower tunnel is on the steep rocky sidehill on the east side of Roxy Creek, near the east side of Little Gem 4 mineral claim. It is reached by a switchback trail from the campsite. It was laid out in a southeasterly direction to intersect the downward extension of the mineralized zone below the upper tunnel and high grade surface showings. One hundred feet in from the portal shearing was encountered, however, and the direction was changed easterly. This change of planned direction resulted in the tunnel

1. R.R. Taylor, personal communication.

being driven in a wide arc to the south and back to the southwest before the mineralized zone was encountered. Hence considerable waste work was done. Good grade mineralization was encountered and later further outlined by diamond drilling. Although the mineralization is not as extensive as that encountered in the upper tunnel, it is similar in character and of commercial grade. About 60 feet of this zone is opened up and the south face is in strongly mineralized material.

Upper Tunnel.

The portal of the upper tunnel is 50 feet southeasterly from the lower tunnel portal and 58 feet higher in elevation. It was driven into the high grade surface showings, opens up 120 feet of mineralized zone, and the east face is in commercial grade mineralization. High grade gold, cobalt and uranium mineralization is exposed. The total footage driven on the upper adit tunnel level is 160 feet.

DIAMOND DRILLING

No diamond drilling from the surface has been done on the property.

A short underground diamond drilling program was started by Estella Mines in the lower tunnel. Six holes, fanned from the inner end of the southeast drift, southerly and easterly, encountered good grade mineralization along the southeast wall of the drift and a second zone a short distance below and east of the tunnel. The results of this limited diamond drilling positively establish the presence of commercial grade mineralization at and below the lower adit tunnel level.

SAMPLING AND ASSAYS

The most complete and conservative sampling of the property has been done by Stevenson,² and his results are as follows:

B.C. Department of Mines,
September, 1948.

ASSAYS, LITTLE GEM MINE
(Nos. 1-39: channel samples)

Sample No.	Width Inches	Gold oz./ton	Silver oz./ton	Equivalent Per Cent Uranium Oxide	Cobalt Per Cent.	Iron Per Cent.	Arsenic Per Cent.	Sulphur Per Cent.	Silica Per Cent.
1	24	1.04	nil	0.0055	3.6				
2	30	0.41	nil	0.030	1.3	28.7	42.6	14.5	6.3
3	72	0.52	nil	0.022	5.1	20.3	48.2	3.7	5.9
4	84	0.32	nil	0.0025	5.1	20.0	61.2	1.6	3.7
5	24	0.24	1.1	0.02	0.3				
6	25	0.27	trace	0.0035	4.4				
7	24	0.35	nil	0.02	3.9				
8	18	1.60	nil	0.007	4.3	25.2	42.2	14.2	2.7
9	60	0.27	nil	0.010	0.9				
10	96	0.87	nil	0.003	0.8				
11	60	0.22	nil	0.01	0.3				
12	24	0.02	trace	0.014	0.5				
13	13	1.24	0.1	0.008	6.0				
14	36	0.53	nil	0.038	3.5				

2. Stevenson, J.L. B.C. Minister of Mines Report 1948 pp. A112-119

15	12	0.61	trace	0.005	5.7				
16	33	0.62	0.1	0.022	4.1				
17	36	0.51	nil	0.032	2.5				
18	39	0.15	trace	0.21	1.5				
19	36	1.09	0.1	0.026	6.6				
20	36	0.23	trace	1.01	1.3				
21	38	0.48	0.3	1.54	2.9	15.4	12.8	4.9	23.2
22	40	0.38	0.1	0.24	3.0				
23	53	0.84	0.3	0.57	4.0	20.1	27.2	9.8	9.8
24	49	0.01	nil	0.23	0.7				
25	52	0.51	0.4	0.21	3.5				
26	34	1.21	0.1	1.04	5.3	21.7	36.8	13.0	9.5
27	23	1.78	trace	0.53	7.2	18.4	32.8	11.6	14.4
28	60	0.76	nil	1.89	5.4				
29	39	1.58	0.1	0.0095	3.8	21.5	31.5	11.3	12.5
30	39	1.82	nil	0.010	1.3				
31	38	0.58	trace	0.003	0.6				
32	24	0.83	0.1	0.003	0.5				
33	48	1.00	nil	0.003	1.4				
34	33	1.26	nil	0.0025	1.1				

35	26	1.40	trace	0.0015	1.2				
36	12	0.34	nil	0.002	0.4				
37	60	0.12	trace	0.004	2.0				
38	80	2.21	trace	0.87	3.1				
39	72	2.14	nil	0.018	4.4	19.8	45.4	3.1	7.6

(Nos. 40-52: Miscellaneous Selected Samples)

40	0.66	nil	0.13	2.4	Upper adit, near Sample No. 27, sulpharsenide and non-metallics.
41	1.46	nil	0.003	3.6	Upper adit, near Sample 27, massive sulpharsenide.
42	0.01	nil	3.20	0.20	Upper adit, dump: mixed sulpharsenide and non-metallics.
43	0.06	0.1	0.35	0.91	Upper adit, dump: principally non-metallics
44	1.66	nil	0.21	4.4	Lower adit, near Sample No. 38, mixed sulpharsenide and non-metallics.
45	0.28	0.1	0.005	6.2	Surface near Sample 7; selected sulpharsenide crystals; also assaying (per cent): Fe, 10.3; As, 60.7; SiO ₂ , 2.7
46	0.33	nil	0.002	6.5	Similar to Sample No. 45.
47	4.56	0.5	0.27	2.8	Highest showings, higher of 2 open-cuts; across 3-inch rib of sulpharsenide and non-metallics.
48	23.34	0.6	0.375	4.6	Location, ditto; check sample across same material as No. 47.
49	7.04	trace	0.75	4.5	Location, ditto; typical mineralization from ore-pile.
50	45.92	1.8	2.80	5.7	Highest showings, lower of 2 open-cuts; across 15-inch wide lens of mixed sulpharsenide and non metallics.

51	1.19	0.2	2.24	0.5	Location, ditto; across a 2-inch rib of molybdenite in the sulpharsenide lens, No. 24.2 per cent.
52	2.10	0.1	2.60	1.6	Location, ditto; typical mineralization from ore-pile.

The samples from the showings near the top of the ridge contained spectacular values as follows:-

<u>Width</u>	<u>Gold (oz.)</u>	<u>Uranium %</u>	<u>Cobalt %</u>
3"	4.56	.27	2.8
Picked	23.34	.375	4.6
Picked	7.04	.75	4.5
15"	45.92 (1607.20)	2.80	5.7

Assay results from 8 samples taken from surface showings directly above the upper tunnel average as follows:-

<u>Width</u>	<u>Gold (oz.)</u>	<u>Uranium %</u>	<u>Cobalt %</u>
51"	.5136	.01	2.836

Assay results from the upper tunnel, along the 120-foot of length, averaged as follows:-

<u>No. of Samples</u>	<u>Length of ore</u>	<u>Width</u>	<u>Gold (oz.)</u>	<u>Uranium %</u>	<u>Cobalt %</u>
20	120'	36"	.765	.388	3.068

Samples from the lower tunnel, taken from the southeast wall of the south drift, where diamond drilling indicated mineable widths of similar mineralization continuous to at least the face of the tunnel, are only 3 in number, but are representative of the better grade mineralization encountered there:-

<u>Width</u>	<u>Gold (oz.)</u>	<u>Uranium %</u>	<u>Cobalt %</u>
71"	1.60	.335	3.23

Sampling of the diamond drill core from the mineralized zone along the east wall of the south drift are as follows:-

<u>Width Inches</u>	<u>Gold (oz.)</u>	<u>Cobalt %</u>
20.4	0.28	0.93
30	0.20	1.28
18	0.28	2.34

and intersections of a mineralized zone about 10 feet easterly from the above are as follows:-

<u>Width Inches</u>	<u>Gold (oz.)</u>	<u>Cobalt %</u>
130.8	0.36	1.39
114.0	0.35	0.90

The samples from the diamond drilling were not assayed for uranium.

INDICATED TONNAGE

A favorable zone 700 feet along with 400 feet of backs occurs on the Little Gem property.

Insufficient exploratory and development work have been done to warrant tonnage calculations under ordinary conditions. Because of the unusual aspects of the property, however, the following calculations are herewith made:

- (1) The mineralized bodies developed to date although comparatively small, contain unusually high grade gold, cobalt, and uranium values, and the profit possibilities are attractive.
- (2) Whereas considerably additional tonnage of similarly

mineralized material may almost certainly be developed on the property, if this should not materialize it is important to establish an estimated value for the presently indicated reserves in order that, should a salvage operation be undertaken, the scope of same may be known.

The tonnage indicated by the upper adit tunnel and overlying surface outcroppings is as follows:-

1. Length of shoot, 135 feet.
2. Height of shoot, 85 feet, being to surface and 25 feet below tunnel level.
3. Average width of shoot 40 inches.
4. Average weight, 1 ton being 10 cubic feet in place.

$$135 \frac{(40)(85)}{(12)} (0.1) = 3825 \text{ tons.}$$

Tonnage indicated by lower adit tunnel, is as follows:-

1. Length of shoot, 70 feet.
2. Height of shoot, 40 feet, being 20 feet above and 20 feet below tunnel level.
3. Average width of shoot, 60 inches.
4. Average weight, 1 ton being 10 cubic feet in place.

$$70 (5) (40) (0.1) = 1400 \text{ tons.}$$

Total indicated tonnage: 5225 tons.

DEVELOPMENT POSSIBILITIES

Two short adit tunnels only have been driven into the mineralized zone on the Little Gem property. This favorable zone is known to be 700 feet in length and 400 feet in height. Also, it is strong, wide, and persistent where exposed and the possibility of it extending to depth is excellent.

Mineralized shoots within this zone are not large, but they are unusually rich in gold, cobalt and uranium. All this data, in the opinion of the writer, suggests a zone of strong mineralization which should be thoroughly explored. Since in both the upper and lower tunnels there is one face in commercial grade mineralization, the first work should be to extend one or both of these. Diamond drilling, both from surface and underground, will be useful for outlining mineralized zones. A limited amount of vertical work will be necessary during the exploratory stage of the program, and considerably more when development of the mineral-bearing shoots is undertaken.

METALLURGY

A considerable amount of test work and research has been done on the problem of working out a suitable method of beneficiation for the complex mineralization from the Little Gem property.

Several methods have been shown to hold excellent possibilities for extraction of the gold and cobalt, and the writer has been assured that, with a limited amount of additional work, the flowsheet could be arranged to include recovery of the uranium.

Extensive laboratory test work has shown possible recoveries of 98% for the gold and 90% for the cobalt.

The processes will require a relatively expensive concentrator and first class supervision.

ECONOMIC CONSIDERATIONS

The taxation laws of Canada are such that a mining property should not be placed into production until it is apparent that a maximum tonnage of ore has been developed. The reasons are as follows:-

1. A period, free of corporation taxes for a new mining property, is allowed - this being 3 years plus six months for concentrator tuning-up.
2. After the above period certain pre-production expenditures may be written off immediately, which, in many cases, adds as much as another year to the tax free period.
3. The above is applicable to any size of new mining operation.

The geological conditions on the Little Gem property point to the possibility of a small-tonnage, unusually high grade mining operation. There are indicated available about 5225 tons of ore on the property now.

If exploratory and development work could successfully prove up seven times this amount, or 36,575 tons of similar material, this could be treated at the rate of 25 tons per day over approximately a four and one half year period.

If the grade which is exposed in the upper tunnel and overlying surface workings could be maintained, it would have the following

approximate gross value, as of prices quoted today (July, 1955):-

Gold	.0.672 ounces @ \$34.00	= \$ 22.95
Cobalt	2.974% or 59.48 pounds @ \$2.60	= 154.65
Uranium	0.2499% U ₃ O ₈ or 4.998 lbs. @ \$7.25/lb.	= <u>36.23</u>
Total Calculated Gross		\$213.83 per ton

If recoveries of 95% gold, 85% cobalt and 75% U₃O₈ are used, the value of the gross recoverable materials would be as follows:-

Gold	22.95 (.95)	= \$ 21.80
Cobalt	154.65 (.85)	= 131.45
U ₃ O ₈	36.23 (.75)	= <u>27.17</u>
Total recoverable Value		= \$ 180.42 per ton

The gross recoverable value of the presently indicated tonnage is 5225 (180.42) = \$942,694.50.

The gross recoverable value of the tonnage that should, if possible, be developed to warrant a 25 ton/day concentrator, or 36,575 tons, is 36,575 (180.42) = \$6,598,861.50.

The data is not presently available to calculate costs but they might be estimated as follows:-

1.	Mining and transportation to concentrator	\$ 12.00/ton
2.	Concentrating and smelting	24.00/ton
3.	Royalty payments	19.00/ton
4.	Exploration and development	2.00/ton
5.	Head Office, Management, Insurance, Depreciation, Capital write-off	1.50/ton
6.	Provincial Taxes, and all other	<u>1.50/ton</u>
Estimated Total Cost/ton		\$ 60.00

The net profit per ton of ore mined, is estimated, therefore,
to be $\$180.42 - 60.00 = \120.42

The net profit from the presently indicated tonnage is estimated
to be $\$629,194.50$

The net profit from 36,575 tons, if same is developed is estimated
to be $\$4,404,361.50$

The estimated cost of a minimum exploratory program:-

1.	Road Equipment, repair and maintain roads	\$ 17,000.00
2.	Build camp accommodations	13,000.00
3.	Mining machinery and supplies	20,000.00
4.	Underground drifting	15,000.00
5.	Underground raising and sinking	10,000.00
6.	Diamond drilling	15,000.00
7.	Office, and contingencies	<u>10,000.00</u>
	Total Estimated Cost	\$ <u>100,000.00</u>

CAMP, TIMBER, WATER & POWER

On the east side of Roxy Creek, there is a suitable location for a campsite. This is the location where Estella Mines had their tent camp.

There is a good supply of timber for camp and mine in the immediate area.

Water is available from Roxy Creek for camp use. Some water is available underground for mining and diamond drilling requirements. It might, however, be necessary to pump water from Roxy Creek.

There is a falls below the camp location on Roxy Creek. There is an excellent flow of water in the creek during most of the year. The writer has been told that an estimated 400 H.P. could be developed from this flow.

CONCLUSIONS

The Little Gem property is located in an accessible part of the Bridge River Area of South Central British Columbia.

Although the property is at an elevation of 6200 ft., in a mountainous area, a road has been built to it, and the road may be opened and maintained at a reasonable cost.

High grade gold, cobalt and uranium mineralization occurs on the Little Gem property, and approximately 5225 tons of available material are now indicated, which it is estimated might net \$120.42 per ton, or a total of \$629,194.50.

There are excellent possibilities for developing additional similarly mineralized material, and if seven times the presently indicated tonnage could be blocked out, a 25 ton per day concentrator would be justified. This concentrator could treat the above mentioned tonnage in about 4-1/2 years which would mean that the operation for that period would be free of corporation taxes, and an estimated profit of \$4,404,361.50 might be realized.

There is also the possibility that sufficient additional tonnage may be discovered to prolong the life of the operation considerably more than the 4-1/2 years mentioned above, and although corporation taxes would be payable, a profitable operation could be continued as long as ore was developed.

RECOMMENDATIONS

It is recommended that arrangements be made for the expenditure of at least \$100,000.00 on the Little Gem property. This will include rehabilitation of the camp, repairs to and maintenance of the road, drifting, raising and sinking, and diamond drilling on the property.

It would be advisable to start the program as soon as possible in order that the camp be completed and underground work under way before the arrival of winter weather, which may be expected about mid-October. Also metal prices are high at this time and financing for such a property as the Little Gem is not too difficult.

(Signed) Alfred R. Allen,
Vancouver, B.C. (Seal)
August 3, 1955

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