

GEOCHEMISTRY - DUCKLING CREEK PROPERTIES

Omineca Mining Division

Tyee Lake Resources Ltd.

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North Vancouver, B. C.

September, 1970

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SUMMARY

A stream geochemistry survey of the Duckling Creek properties of Tyee Lake Resources Ltd. was done in August, 1970. Samples were analyzed for total copper (hot digestion) and for cold extractable copper.

Four anomalous drainage basins were indicated. The most interesting is that of Rondah Creek, where pyrite mineralization, copper mineralization, and induced polarization anomalies have been found. The best geochemical values are in small streams draining the areas of two high induced polarization anomalies.

Two creeks draining the southwest part of the Duck claim group have good copper anomalies that are persistent downstream. Mapping and prospecting are necessary to determine whether soil geochemistry and geophysical work are warranted.

The creek draining the central part of the Duck Group is anomalous. Soil sampling has been done in previous surveys. Further geological mapping has been recommended. Some bulldozer stripping in the upper parts of the basin is recommended.

The fourth anomalous drainage basin is in the north part of the Duck claim group. Further stream geochemistry is needed to pinpoint an exploration target.

GEOCHEMISTRY - DUCKLING CREEK PROPERTIES

INTRODUCTION

In order to help compare the relative merits of some zones of copper mineralization and in order to find additional mineralized zones, the writer recommended a program of stream geochemistry. In August 1970, the writer planned such a program and sent an experienced silt sampler to the area to collect the samples.

The sampling was done between August 19 and August 21, 1970. This was done after a very long, dry period during which there had been negligible precipitation.

CLAIMS AND OWNERSHIP

At the time of the geochemical survey the Duckling Creek properties belonging to Tyee Lake Resources Ltd. included the following claim groups: Duck 1 to 52 inclusive, Rondah 1 to 16 inclusive, Duke 1 to 24 inclusive, Duke fractions 25 to 29 inclusive and Rondah fractions 17 to 19 inclusive. These groups adjoin so as to form one large block of 100 claims.

LOCATION AND ACCESS

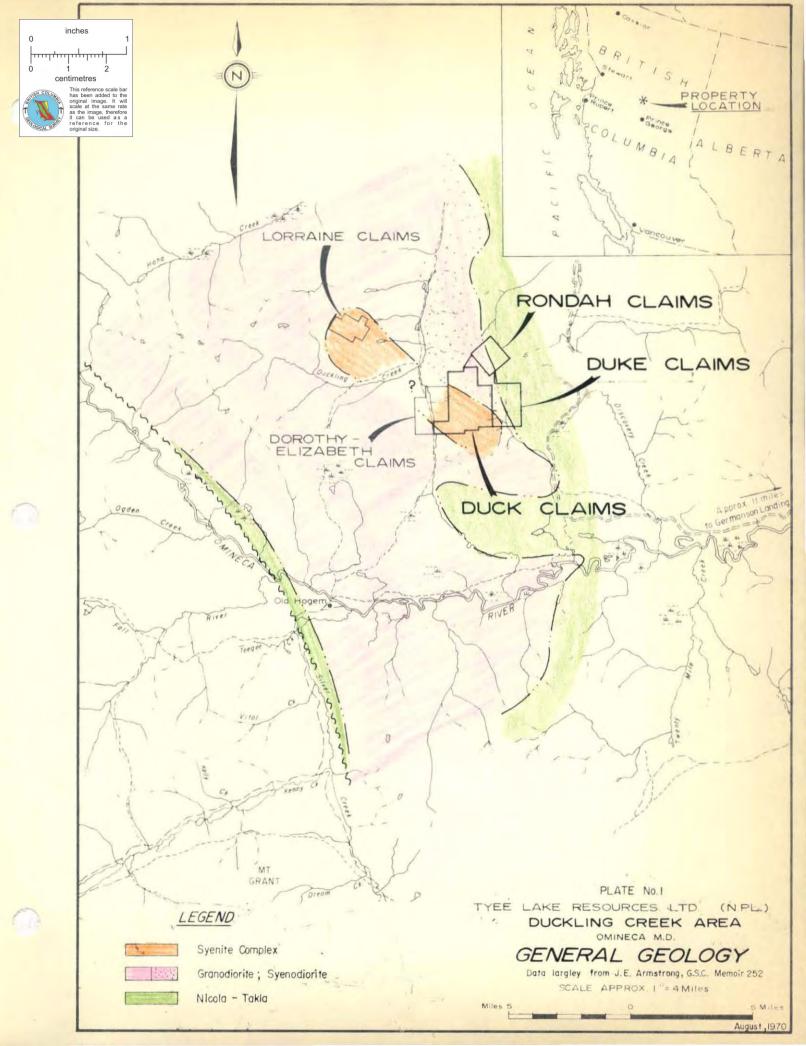
The Duck group of claims is at latitude 56°54'N, longitude 125°19'W, mostly between elevations 5000 feet and 6500 feet. It is four miles west of the Uslika Lake access road, 25 miles northwest of Germansen Landing, and 100 miles northeast of Smithers.

Access was via helicopter from Smithers or from Fort St. James, or via the Uslika Lake access road from Fort St. James -- a distance of 170 miles.

TECHNIQUES

Composite silt samples (several sample points) were collected at each sample site, mainly from the active stream channel. In addition a few water samples were collected to get the general range of pH. A topographical base map (scale 1" = 1000) was used in the field work and in the final compilation.

The silt samples were analyzed by Vancouver Geochemical Laboratories Ltd. for total copper and for cold extractable copper. The total copper extraction was done with perchloric acid and hydrochloric acid digestion and detected by atomic absorption. The cold extractable copper was done by the Holman technique. The procedures are outlined in the appendix.



Sample results are plotted on two separate maps and coloured according to a suitable scale. The scale is designed so that, in a general way, "Holman copper" anomalies will correspond with "total copper" anomalies.

GEOLOGY

The Duckling Creek area is largely within the Hogem Batholith. This batholith is differentiated into a granodiorite-granite core with syenodiorite or more basic rock forming a border zone from a fraction of a mile to several miles wide. In many places the various rock types grade imperceptibly into one another. In the Duckling Creek area, salmon-coloured syenites are a prominent rock type within the batholith and are probably genetically related to widespread copper mineralization.

The eastern contact of the Hogem Batholith, in the Duckling Creek area, intrudes basic volcanic rocks of the Takla Group -- a formation of Upper Triassic-Lower Jurassic age. Alteration of the basic volcanic rocks along the contact consists of hornfelsing and pyritization, with local epidote and/or pink feldspar colouration, both as veining and as pervasive replacement.

The Duck claim group occurs within the batholith and is underlain by syenites, syenodiorites, and a few hornfelsed pendants of the Takla Group. The Rondah and the Duke groups straddle the eastern contact of the batholith. Pyritization is evident in the altered volcanics along this contact.

Copper mineralization is widespread in the area. Disseminated chalcopyrite occurs throughout much of the intrusive body (syenodiorite and syenite). Float and outcrop of altered rock, mineralized with abundant chalcopyrite and pyrite, occurs near the batholith contact on the Rondah claim group.

GEOCHEMISTRY - GENERAL

The total copper extraction, as done at Vancouver Geochemical Laboratories Ltd., removes almost all of the copper. This includes copper occurring in copper carbonates, copper oxides, limonites, organic material, clay material, and most of that in the silicates. Possibly some of the copper occurring in silicates and some of that occurring in magnetite would not be extracted.

The Holman copper technique extracts copper from the copper carbonates, the copper oxides, and the iron limonites. It also extracts copper loosely adsorbed on organic material, clays, etc.

Thus the Holman copper has a greater tendency to depend for its values on copper which is removed from the copper deposit and carried in solution downstream to be precipitated or adsorbed. The presence of abundant disseminated pyrite in the copper deposit, on oxidizing, produces sulphuric acid to promote the solution and transport of the copper. As the solution is carried downstream and becomes diluted, its pH is increased (decrease in acidity) and some of the copper may precipitate out to form the readily soluble copper that is extracted by a Holman copper technique.

This phenomenon can create peak Holman copper values a short distance downstream from the copper deposit rather than right at the deposit. The values for "total copper" will consequently be similarly affected. The "total copper" values can also be increased by the mechanical abrasion and sorting that occurs as the debris is carried down a stream. Thus these two phenomena serve to create a peak copper value a short distance downstream from the copper mineralization. This peak copper value can decrease, over a short distance upstream, to somewhat lower anomalous values at the deposit and it can decrease downstream, over a much longer distance, to background value.

GEOCHEMICAL RESULTS

The widespread disseminated copper in the batholith of this area is mostly in the form of chalcopyrite. Rock geochemistry indicates that background values in unmineralized rock are exceptionally low (i.e. the silicate minerals contain very little copper).

Because of the widespread disseminated chalcopyrite, all stream samples are much higher than usually found in other parts of British Columbia. One might even say that all values were somewhat anomalous and no well established background value can be determined over the limited area of this survey.

Because all of the samples are taken in an area of anomalous copper values, no good threshold values can be established. The histograms or frequency distribution curves show that the majority of values for total copper are between 120 ppm and 220 ppm. There is no sharp change from frequency of background values to frequency of anomalous values. The histogram for Holman copper values shows that the majority of values are between 3 and 6 ppm and that there is a possible threshold value to the more highly anomalous values, at about 10 ppm copper.

Nine water samples were taken throughout the survey area to determine pH and copper values. All pH values were between 7.3 and 7.7. This indicates a relatively low-acid environment.

The geological mapping of the entire area and of the Rondah claim group, done by Mr. C. A. R. Lammle, and the induced polarization (chargeability) maps for the Rondah claim group, produced by Geoterrex Limited, have been used in appraising the stream geochemistry.

Four anomalous drainage basins have been indicated by the silt geochemical survey. These are marked on the total copper map as areas "A" to "D" inclusive. In addition, some comments are made on area "E" along Access Creek.

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Area "A" - Rondah Group

The eastern contact of the Hogem Batholith, as outlined by Mr. Lammle, extends from the centre of the Rondah claim group in a southsoutheasterly direction. However to the north of Rondah Creek the contact occurs in the extreme northeast corner of the claims. Thus there appears to be a fault offset or a major irregularity in the contact.

Pyrite mineralization has been noted in the volcanics along this contact. In addition, chalcopyrite occurs in outcrop and in float near the contact in the central part of the claim group.

The induced polarization survey has outlined a major anomaly in the central part of the claim group coincident with the pyritized volcanics and the area of copper mineralization. A second induced polarization anomaly has been partially outlined along the northeast contact of the Rondah claim group. This Northeastern anomaly should be in the vicinity of the offset batholith contact.

In view of the known copper mineralization on Rondah Creek and the presence of a copper-in-soil anomaly, good stream geochemistry was anticipated. Rondah Creek is highly anomalous (>300 ppm) throughout the northern part of the claim group. Much of this anomalous condition is contributed by the area of the Main induced polarization anomaly; there is a fairly good cutoff (sharp decrease in geochemical values) a short distance upstream from the Main induced polarization anomaly. Some of the best geochemical values (940 ppm and 720 ppm total copper) occur in streams which enter Rondah Creek from the east -- streams that drain the area of the Northeastern induced polarization anomaly.

Thus the stream geochemistry has enhanced the general exploration picture and has indicated that additional claims are needed to the northeast and north of the original Rondah Group and that the grid with its various exploration techniques (geochemistry and geophysics) should be extended in this area.

About 3000 feet southeast of the anomalous Rondah Creek, and draining in a sub-parallel direction, is another small creek that is somewhat anomalous. This small stream drains the area of the batholith contact in the southeast corner of the Rondah Group. The anomalous geochemical values may be caused by disseminated pyrite accompanied by minor copper in the meta-volcanics, or it might be caused by additional interesting copper mineralization near the contact.

Area "B" - Duck Group

The upper part of the creek draining the central part of the Duck Group splits into two parallel branches, both highly anomalous in copper (800 ppm and 900 ppm). These anomalous values could be caused by the disseminated copper which occurs in the syenodiorites at the head of the basin, or by additional unknown copper mineralization in buried parts of the basin. Soil geochemistry already done has outlined a copper anomalous zone in the eastern part of the basin. Additional mapping and geophysics have been recommended in a previous report (Woodcock, August 1970).

Area "C" - Southwest Duck Group

The most interesting new area disclosed by the stream geochemistry occurs at the headwaters of two creeks (a westerly-flowing creek and a southerly-flowing creek) in the southwest part of the Duck claim group. In this area, syenites and syenodiorites are cut by a strong, persistent porphyry dike that strikes northwesterly.

The values in total copper are high and persistent downstream. The values in cold extractable (Holman) copper are the highest found in the area, and are also persistent downstream. The high Holman copper values may indicate fairly abundant pyrite.

The high copper values (both Holman and Total) and their persistent nature downstream indicate that this is a worthy target for further investigation.

Area "D" - North Duck Group

At the north end of the Duck Group, a basin is drained by two parallel northwesterly-flowing streams. Copper values in these streams are moderately anomalous. The anomalous copper values in the northerly stream of the two are not persistent downstream; whereas the limited number of samples from the southerly stream do indicate some persistence of anomalous values throughout the length of the stream. Further silt samples should be taken along this southerly stream with a view to more closely pinpointing a target.

Area "E" - Access Creek

Because the contact of the batholith is a favourable loci for copper mineralization, and because this contact runs southerly along the slopes east of Access Creek, it is necessary to review the geochemical results in this area. Only one highly anomalous total copper value occurs (795 ppm) and this is accompanied by a high Holman copper value (24 ppm). However this value is from a small gully that enters Access Creek from the east. The amount of copper contributed by the small stream is not sufficient to affect the values found in Access Creek below the junction.

The geochemical values in some streams draining into the east side of Access Creek have not indicated any favourable exploration target.

CONCLUSIONS AND RECOMMENDATIONS

1. The good geochemical results in Rondah Creek appear to come from the areas of the Main induced polarization anomaly and the Northeastern induced polarization anomaly. The survey indicated that additional claims are needed to the northeast and to the north of the Rondah Group, and that the survey grid (geochemistry and geophysics) should be extended to the northeast.

2. The creeks draining the central part of the Duck claim group are anomalous (Area "B"). Further work has been recommended in a previous report.

3. The highly anomalous values (both in total copper and in Holman copper) and their good persistence downstream in the vicinity of Area "C", indicates a good exploration target. These high geochemical values occur in one stream draining southerly and one stream draining northwesterly. A few additional silt samples taken in a second branch of the northwesterly-flowing stream should help delimit the anomaly in the northern direction.

The area should be mapped and prospected to determine if a grid for soil samples and geophysics is necessary.

4. Area "D" includes two creeks draining one basin. The southerly creek contains moderately anomalous geochemical values which are persistent downstream. Further silt sampling should be done along this stream and its small tributaries to help pinpoint a possible exploration target.

lagak September 1970

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Lammle, C. A. R. August 1970. Reconnaissance Geology and Geochemistry, Duck and Rondah Claims. (private company report).

Norgaard, P. September 1970. Induced Polarization Survey for Type Lake Resources Ltd. (private company report).

Woodcock, J. R. August 1970. The Duckling Creek Properties. (private company report).

1521 PEMBERTON AVENUE NORTH VANCOUVER, B.C., CANADA

TELEPHONE: 604-988-2171

J. R. WOODCOCK CONWAY CHUN

TO:

J.R.Woodcock Consultants Ltd.

1521 Pemberton Ave.

North Vancouver, B. C.

FROM: Mr. Laurie Nicol, Supervisor Chemist Vancouver Geochemical Laboratories Ltd. 1521 Pemberton Avenue North Vancouver, B.C.

SUBJECT: Analytical procedure used to process acid soluble copper in geochemical samples received from J.R. Woodcock Consultants Ltd.

1. Sample Preparation

- (a) Geochemical soil, silt and $\frac{1}{2}$ samples were received in the laboratory in wet-strength $3\frac{1}{2} \times 6\frac{1}{2}$ Kraft paper bags.
- (b) The wet samples were dried in a ventilated oven.
- (c) The dried soil and silt samples were sifted, using an 80-mesh stainless steel sieve. The plus 80-mesh fraction was rejected and the minus 80-mesh fraction was transferred into a new bag for analysis later.
- (d) The dried rock samples were crushed and pulverized to minus 80-mesh. The pulverized sample was then put in a new bag for later analysis.

2. Methods of Digestion

- (a) 1.00 gram or 0.50 gram of the minus 80-mesh samples was used. Samples were weighed out by using a toploading balance.
- (b) Samples were heated in a sand bath with nitric and perchloric acids (15% to 85% by volume of the concentrated acids respectively).

Continued

- 2. <u>Methods of Digestion</u> (Continued)
 - (c) The digested samples were diluted with demineralized water to a fixed volume and shaken.

3. Method of Analysis

4.

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The copper analyses were determined by using a Techtron Atomic Absorption Spectrophotometer Model AA4 or Model AA5 with their respective hollow cathode lamp. The digested samples were aspirated directly into an air and acetylene flame. The results, in parts per million, were calculated by comparing a set of standards to calibrate the atomic absorption unit.

The analyses were supervised or determined by Mr. Conway Chun, or Mr. Laurie Nicol and their laboratory staff.

Nicol

VANCOUVER GEOCHEMICAL LABORATORIES LTD.

1521 PEMBERTON AVENUE NORTH VANCOUVER, B.C., CANADA TELEPHONE: 604-988-2172

J. R. WOODCOCK CONWAY CHUN

TO:

J. R. Woodcock Cnnsultants Ltd.

1521 Pemberton Ave. North Vancouver, B. C.

- FROM: Mr. Laurie Nicol, Supervisor Chemist Vancouver Geochemical Laboratories Ltd. 1521 Pemberton Avenue North Vancouver, B. C.
- SUBJECT: Analytical procedure used to process cold extractable copper in geochemical samples by using citrate buffer and dithizonebenzene solution.

1. Sample Preparation

- (a) Geochemical soil and silt samples were received in the laboratory in wet-strength $3\frac{1}{2} \times 6\frac{1}{2}$ Kraft paper bags.
- (b) The wet samples were dried in a ventilated oven.
- (c) The dried soil and silt samples were sifted, using an 80-mesh stainless steel sieve. The plus 80-mesh fraction was rejected and the minus 80-mesh fraction was transferred into a new bag for analysis later.

2. Mothod of Analysis

- (a) 0.50 gram of the minus 80-mesh samples was used. Samples were weighed out into test tubes using a top-loading balance.
- (b) 5 ml of citrate buffer solution was added to the sample.
- (c) 5 ml of a 0.001% dithizone in benzene solution was added.
- (d) The mixture was capped and shaken vigorously for 15 seconds and then allowed to settle.

Continued . . . 2

- 2. Method of Analysis (Continued)
 - (e) The concentration of cold extractable copper was estimated by comparing the dithizone-benzene layer with a set of copper standards made up using a similar procedure as above.

2 -

3. Proparation of Reagents

(1) Citrate buffer solution:

50 ml conc. HCl acid mixed with 50 grams of ammonium citrate and 20 grams of hydroxylamine hydrochloride in 1 liter of metal-free water.

- (2) Dithizone solution:
 - (a) Stock solution:

0.01 gram of dithizone in 50 ml of toluene.

(b) 0.001% working solution:

10 ml of 0.02% in 190 ml of benzene.

4. The analyses were supervised or determined by Mr. Conway Chun, or Mr. Laurie Nicol and their laboratory staff.

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1521 PEMBERTON AVENUE NORTH VANCOUVER, B.C., CANADA TELEPHONE 604-988-2172

GEOCHEMICAL ANALYTICAL REPORT

REPORT No	September 3, 1970
SAMPLES SUBMITTED BYAmex.Expl. SvesCOMP	ANY J.R. Woodcock Consultants Ltd.
SHIPPED VIA	Tyee Lake Resources
REPORT ON 117 samples for Cu & DATE S ExCu - Holmam Cu * * *	SAMPLES ARRIVED Sept. 1, 1970
COPIES OF THIS REPORT SENT TO:	TRANSMITTED BY:
() Mr. R. Lammle - Tyee Lake Resources	mail
(2) J.R. Woodcock - Vancouver Office	deliveréy
(3) Altair Drafting Services	pick up
SAMPLES SIFTED OR GROUND TO	WEIGHT USED
FINAL VOLUME	, - ,
. * * *	
METHOD OF ANALYSIS: Instrumental for	or total Cu : Colori. for ExCu
EXTRACTION: $\frac{\text{HC10} - \text{HN0}}{4}$ for total Cu,	Acetic buffer for ExCu
DETECTION: Techtron AA5 for total Cu	
SAMPLES ASSIGNMENT: (a) PREPARED SAMPLES:	filed
(b) REJECTS:	discarded
* * * ANALYST(S)	hi
SUPERVISING CHEMIST L. Nicol CHECK	ED BY
nd = none detected	SHIPPING CHARGE \$
	SAMPLE PREPARATION \$ 23.40 216.45 216.45 OTHER 239.85 TO T A L \$ 239.85

SPECIALIZING IN TRACE ELEMENT ANALYSIS

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MARKING	Cu	Hol Cu			MARKING	Cu	Hol Cu	
C-70- 1-L	84	4						
2	170	16			C-70-21-L	164	·	coarse
3	230	12			2	110	4	coarse
4	160	16			3	134	4	
5	160	nd	coars	e	4	255	4	
6	227	8	coars	e	5	158	l	
7	353	16			6	290	4	
8	417	16			7	475	16	
9	230	8			8	440	4	
10	152	l	coars	e	29	400	24	
1	180	12			30	260	4	
2	135	4			1	365	16	
3	278	12			2	720	12	
<u>1</u> ;	165	6			4	640	16	
5	662	16			5	380	8	coarse
6	165	4			6	595	nd	
7	250	6	coars	e	38	204	nd	
8	725	12			40	140	nd	
19	632	24			1	125	nd	
C-70-20-L	320	12			C-70-42-L	354	nd	

REMARKS nd = none detected

All values are reported in parts per million unless specified otherwise. All values are believed to be correct to the best knowledge of the analyst based on the method and instruments used.

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MARKING	Cu	Hol Cu		MARKING	Cu	Hol Cu	
C-70-43-L	334	- 8					
ė.	345	4		C-70-65-L	120	l	
5	198	16		6	240	6	
6	227	16		7	190	4	
7	540	8		8	168	4	
8	290	nd		69	177	1	
49	230	6		70	340	6	- is
50	118	6		l	225	6	
1	220	6		2	63	1	
2	290	6		3	310	4	
3	102	4	 	4	380	6	
4	131	4		5	225	6	
6	208	4		6	273	8	
77	180	1		7	284	8	
8	164	8	 	8	285	4	
59	900	24		79	250	8	
61	800	16		80	540	12	
2	212	6		11	470	12	
33	638	14_		2		4	
C-70-64-L -	92	<u> </u>		C-70-83-L	490	14	

All values are reported in parts per million unless specified otherwise. All values are believed to be correct to the best knowledge of the analyst based on the method and instruments used.

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MARKING	Cu	Hol Cu	MARKING	Cu	Hol Cu	
C-70- 84-L	455	28				
5	640	48	C-70-108-L	130	ı	
6	340	48	9	795	24	
7	290	24	10	162	4	
8	595	45	 1	123	4	
89	543	48	2	170	16	
90	262	4	3	102	4	
1	473	36	 4	93	<u> </u>	
2	300	16	5	145	1	
3	440	16	6	85	4	
4	193	1	7	148	4	
5	178	1	8	133	4	
	140	<u> </u>	19	187	6	
98	101	1	20	74	4	
100	127	4	1	185	8	
2	75	1	2	168	4	
4	147	1	3	315	16	
	227	1	 4	375	4	
6	110	1	 	270	4	
C-70-107-L	150	1	C-70-126-L	940	36	

All values are reported in parts per million unless specified otherwise. All values are believed to be correct to the best knowledge of the analyst based on the method and instruments used.

