

# 811848

### SUMMARY REPORT

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on

## THE KALDER LAKE PROJECT

OMINECA MINING DIVISION

55°N 124°15'W 93K/16

· for

## CREW NATURAL RESOURCES LTD.

by

J.B.RICHARDS, P.Eng.

JB ENGINEERING LTD.

March 1, 1991



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#### SUMMARY

Crew Natural Resources Ltd holds 18 unsurveyed mineral claims containing 349 units, covering 7545ha in the Fort St James area of central British Columbia.

The area is underlain by late Triassic to early Jurassic Takla Group volcanics and sediments intruded by upper Jurassic to lower Cretaceous gabbroic to granodioritic intrusives that are associated with known ore bodies.

Geochemical and geophysical surveys over the claims show that the area is prospective for a bulk type copper - gold deposit similar to the nearby Mt Milligan deposit, reported to contain 440MT of .2% copper and .48g/T gold.

A two stage program of geochemistry, geophysics and diamond drilling is recommended costing \$250,000.

#### INTRODUCTION

Crew Natural Resources Ltd. holds 18 unsurveyed mineral claims in the Fort St James area of central British Columbia. See Figure 1, Location Map

The claims have been held by various associated companies, and were known as the Tez Project, and the Tas East Project. The two contiguous claim blocks have now been amalgamated under the ownership of Crew Natural Resources Ltd., and are collectively referred to as the Kalder Lake Project.

JB Engineering Ltd. has been retained by Crew Natural Resources Ltd. to review all available data on the Kalder Lake Project and report on the potential of the project, and make recommendations for further work.

The author has not visited the property.

The data reviewed, and in some cases included in this report is all contained in published reports by other authors, as listed in the REFERENCES section.

#### CLAIMS AND STATUS

The Kalder Lake Project consists of 18 unsurveyed mineral claims consisting of 349 units, covering approximately 7,935 Ha. See Figure 2, Claims Map. The claims with their relevant statistics are tabulated below in Table 1.

As mentioned in the introduction above, the claims that form the Kalder Lake Project are held under two separate agreements that formerly were called the Tas East and Tez Projects.



The Tas East Project consisted of the Tez 3 & 4, H+H 1 & 2, Sep 1, and Mach 1 -3 mineral claims. The claims were acquired by TP Resources Ltd under the terms of an option agreement from the owners, A.A.Halleran, A.D.Halleran and U.Schmidt in May 1988. After a change of name from TP Resources to Crew Natural Resources Ltd., Crew Natural Resources Ltd. assigned their interest to Fraser Explorations Ltd. who did exploration work on the claims, and added by purchase the Cat 1 and Sno 1 & 2 claims. Crew Natural Resources Ltd. resumed their interest in the claims by purchasing back Fraser Explorations Ltd.'s interest in February 1990.

The original vendors are due advance royalty payments of \$30,000. per annum, due on or before May 10th of each year until the claims are put in commercial production, against a 2.5% N.S.R. royalty.

The Tez Project consisted of the Tez 1,2,5,6 and 7 claims. The claims were acquired from the Hallerans and U.Schmidt in August 1988 by Crew Capital Corporation, a private company. In June 1989 Crew Capital Corporation assigned their interest in the claims to International Capri Resources Ltd who did exploration work on the claims. In May 1990 Crew Natural Resources Ltd. purchased International Capri's interest in the claims under an option agreement. Under the terms of this agreement a final payment of \$20,000. is due to International Capri on or before May 1, 1991.

The original vendors are due advance royalty payments of \$15,000. per annum, due on or before August 29th of each year until the claims are put in commercial production, against a 2.5% N.S.R. royalty.

The Tez 15 and 16 claims were acquired by purchase by Crew Natural Resources Ltd. and are not subject to any option payments or N.S.R. payments.

Although under the several agreement all claims are nominally 100% owned by Crew Natural Resources Ltd. ( subject to NSR interests ) the eastern 1,000m. of the H+H 1 & 2 claims are subject to an "area of influence" agreement between the optionors and Noranda Explorations, so are effectively not owned by Crew Natural Resources Ltd. The area excluded is indicated on the Claims Map, Figure 2, and amounts to 390 ha., leaving the net area of the claims owned by Crew Natural Resources Ltd. to be 7545ha. A legal survey of the claims may reveal more or less area, depending on positions of prior claims.

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	<u>Claims Hel</u>	<u>d by Crew Na</u>	tural Resources Ltd	Free and Clear
Name	# Units	Record #	Record Date	Expiry Date
Cat 1	20	9851	Sept. 30, 1988	Sept. 30, 1991
Sno 1	20	10373	Apr. 22, 1989	Apr. 22, 1992
Sno 2	20	10374	Apr. 23, 1989	Apr. 23, 1992
Tez #15	20	11757	Apr. 18 1990	Apr. 18, 1991
Tez #16	20	11758	Apr. 18 1990	Apr. 18, 1991
	<u>Claims He</u>	ld by Crew N	atural Resources Lt	d Under Option
Name	<u># Units</u>	Record #	<u>Record</u> <u>Date</u>	Expiry Date
H+H 1	20	7671	July 7, 1986	July 7, 1994
H+H 2	20	7672	July 7, 1986	July 7, 1994
Sep 1	20	7972	Oct. 9, 1986	Oct. 9, 1993
Mach 1	20	8820	Sept. 8, 1987	Sept. 8, 1992
Mach 2	20	88 <b>29</b>	Sept. 8, 1987	Sept. 8, 1992
Mach 3	20	8830	Sept. 8, 1987	Sept. 8, 1993
Tez #1	20	9643	Aug. 12, 1988	Aug. 12, 1991
Tez #2	20	9644	Aug. 12, 1988	Aug. 12, 1991
Tez #3	20	9379	Apr. 27, 1988	Apr. 27, 1992
Tez #4	20	9380	Apr. 27, 1988	Apr. 27, 1993
Tez #5	20	9481	June 21, 1988	June 21, 1991
Tez #6	20	9482	June 21, 1988	June 21, 1991
Tez #7	9	9491	June 24, 1988	June 24, 1991

TABLE 1 CLAIMS

A bill of sale has not yet been registered on the Tez 1 - 7 claims, transferring title to Crew Natural Resources Ltd. They remain registered in the name of one of the optionors, U.Schmidt. There does not appear to be any impediment to the transfer of title to Crew Natural Resources Ltd..

The above claim data, apart from the expiry dates is derived from data provided by Crew Natural Resources Ltd. The expiry dates are as they appear in the records in the Vancouver Mineral Title office.

LOCATION AND ACCESS

The Kalder Lake Project is located on the interior plateau in central BC, 55km north of Fort St James at  $55^{\circ}N$  latitude,  $124^{\circ}15'W$  longitude, N.T.S. sheet 93K/16. See Figure 1, Location.

The area is one of low relief, elevations range from approximately 910 to 975

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metres above sea level. The lower portions tend to be swampy, with meandering creeks.

Access to the property is via the all-weather Germansen road from Fort St. James, and several subsidiary logging access roads, notably the Inzana Main.

The nearest railhead is the British Columbia Railway at Fort St. James.

#### HISTORY

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Exploration in the immediate Kalder Lake Project area has been more or less continuous since 1984 when Noranda and successors began work on the copper-gold Tas Project which is contiguous with the Kalder Lake Project. ( See Figure 2, Claims Map ) Exploration on the Kalder Lake Project began in 1986 with the staking of the claims by Halleran et al over magnetic highs located from government air borne surveys that were also underlain by the Tas claims.

Work to date filed for assessment credits on the claims that comprise the Kalder Lake Project consists of:

- 1987, Halleran, reconnaissance soil sampling on Tas East. \$6,200.
- 1988, Schmidt, for Fraser Explorations, Detailed grid soil sampling, on Tas East \$88,400.
- 1989, Schmidt, for International Capri Resources, Recognizance geochemistry and geology, on Tez \$9,300.
- 1990, Schmidt, Detailed grid soil sampling and helicopter borne magnetic and VLF-EM survey on the Cat 1 claim \$5,100.
- 1990, Schmidt. Detailed grid soil sampling and helicopter borne magnetic and VLF-EM survey on the Sno 1 & 2 claims. \$9,000.
- 1990, Schmidt, for International Capri Resources, Helicopter borne magnetic and VLF-EM survey, on Tez <u>\$9,900.</u>

Total expenditures to date on the Kalder Lake Project \$127,900.

#### GEOLOGY

Regional Geclogy

The Kalder Lake Project lies within the Quesnel Trough, a subdivision of the Intermontaine tectonic belt.

The most recent regional geologic mapping published is by J.E.Armstrong in





#### G.S.C. memoir 252 with map 907A.

The rocks are predominately island - arc volcanics and sediments of late Triassic to early Jurassic age, known as the Takla Group. The undivided Takla Group consists of an apparently conformable interbedded basaltic and andesitic flows, tuffs, breccias and agglomerates with shale, greywacke, conglomerate and limestone.

The Takla Group is intruded by various phases of the upper Jurassic to Lower Cretaceous Omineca intrusions, which range in composition from gabbro to granodiorite.

Structures tend to be north-westerly, parallel to the Pinchi fault which bounds the Takla rocks to the east, and the M<sup>c</sup>Leod Lake fault which bounds them on the west.

The area has been subjected to glaciation during the Pleistocene, with ice movement from south-west to north-east. Glacial till covers most valleys and low hills, to a depth of up to 120m.

The Quesnel Trough is host to several bulk type copper deposits, notebly the 1 billion plus tonne Valley Copper deposit in the Highland valley, and the more recently discovered Mt Milligan deposit located about 25km to the north-east reported to contain about 440 million tonnes of .2% copper with .54 g/T gold.

See Figure 3, Regional Geology.

#### Property Geology

Outcrop on the Kalder Lake Project is so sparse that little can be said other than that the property is probably underlain by Takla Group volcanics and sediments, as the regional geology suggests, and that the intrusives present are dioritic, and have hornfelsed the sediments in the immediate area of intrusion. Approximately 30 small outcrops have been located on the property, their positions and rock types are noted on Figure 5, GEOLOGY and GEOCHEMICAL SURVEYS.

Some information on the Kalder Lake Project geology may be inferred from the geology of the Tas Project that lies in the centre between the TEZ and Tas East. Work by Noranda et al since 1984, and filed for assessment credits ( A.R. 15687, 16763, & 17234 ) describes hornfelsed sediments/volcanic sediments intruded by hornblende-augite porphyry and weakly porphyritic quartz diorite to diorite. All units contain in the order of 2-5% disseminated sulphides, largely pyrite and pyrrhotite with minor chalcopyrite. The diorite is described as being moderate to strongly magnetic due to contained pyrrhotite and magnetite and cuts all other units. These are very likely the same units seen on the Kalder Lake Project.

The best developed targets on the Tas, the "Freegold " and " Ridge " zones, (see Figure 1.) contain these sulphidized sediments and intrusives with the only significant gold or copper assays coming from sulphide or sulphide/magnetite filled tectonic breccia zones in the order of 1m wide containing 1 to 15 g/T gold and .1 to .3% Cu. Alteration as described by the Noranda geologists appears to be fairly weak and places the area in the outer



propylitic zone associated with large hydrothermal systems.

#### GEOCHEMISTRY

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Reconnaissance and detail grid soil sampling has been done over much of the Tas EAST area, and reconnaissance soil sampling only over the TEZ area. (Schmidt, 1989, 1990). See Figure 3 for coverage of the project area, and Figures 19 and 20, 24 and 25, 29 and 30 and 34 and 35. for anomaly detail. All samples were taken by the same crew using the same procedure, and analyzed in the same laboratory. Samples were analyzed for molybdenum, copper, lead, silver, nickel, cobalt, manganese, iron, and arsenic by I.C.P., and gold by acid leach and A.A. Gold and copper detail are presented as they are the elements of most immediate economic interest. None of the other elements analyzed for appear to be better pathfinders for copper-gold deposits then copper and gold themselves.

Schmidt considered gold analyses above 10ppb and copper above 50ppm to be thresh-hold. The anomaly details referred to above indicate analysis by scaled circles at the sample points.

As it was not clear from Schmidt's reports how the anomalous levels were determined, the author obtained copies of the 2,219 analysis and prepared cumulative probability plots of the copper and gold in soil. The tabulated data is to be found below, as TABLE 2, the cumulative probability plots are figures 5 and 6 below.

## STATISTICS OF COPPER IN SOILS

RANGE	COUNT	COUNT &	CUMM. 3
10	5	0.23%	0.23%
20	159	7.17%	7.39%
30	628	28.30%	35.69%
40	599	26.99%	62.69%
50	403	18.16%	80.85%
60	184	8.29%	89.14%
70	101	4.55%	93.69%
80	54	2.43%	96.12%
90	27	1.22%	97.34%
100	14	0.63%	97.97%
110	6	0.27%	98.24%
120	11	0.50%	98.74%
130	7	0.32%	99.05%
140	7	0.32%	99.37%
150	2	0.09%	99.46%
160	2	0.09%	99.55%
170	1	0.05%	99.59%
180	1	0.05%	99.64%
190	2	0.09%	99.73%
200	2	0.09%	99.82%
-	4	0.18%	100.00%
	2219	100.00%	

### STATISTICS OF GOLD IN SOILS

RANGE	COUNT	COUNT %	CUMM. %
2	782	35.24%	35.24%
3	210	9.46%	44.70%
4	202	9.10%	53.81%
5	167	7.53%	61.33%
6	144	6.49%	67.82%
8	164	7.39%	75.21%
10	119	5.36%	80.58%
14	121	5.45%	86.03%
18	87	3.92%	89.95%
22	57	2.57%	92.52%
26	36	1.62%	94.14%
30	21	0.95%	95.09%
34	14	0.63%	95.72%
38	13	0.59%	96.30%
42	10	0.45%	96.76%
46	7	0.32%	97.07%
50	5	0.23%	97.30%
54	5	0.23%	97.52%
58	8	0.36%	97.88%
_	47	2.12%	100.00%
-	2219	100.00%	

## TABLE 2 SOIL SURVEY STATISTICS



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As is to be expected in areas of deep drift cover, the anomalies are quite low, the copper especially, but the cumulative probability plots show that there are two distinct populations present for each metal, the background and the anomalous populations. According to the gold plot, Figure 5, there would be less then .01% of the background population having a analysis above 25ppb, the approximately 5% of the population that is above 25ppb may be regarded as anomalous, while those lying between 10 and 25ppb are probably anomalous. In the case of the copper, approximately 8% of the population is above 64ppm whereas one would expect from the slope of the background population, only .01% would be above 64ppm. 20% is above 50ppm while only 2% would be expected to be above 50ppm from the background population. Based on the above, Schmidt's selection of anomalous levels for gold and copper in soils would seem to be realistic.

#### GEOPHYSICS

erer. A All the Kalder Lake Project with the exception of the Tez 15 and 16 claims were covered by a helicopter borne aeromagnetic and VLF-EM survey in September of 1989. Approximately 220 line-km of survey were done on lines 100m apart. Separate maps of the TEZ and Tas EAST areas were prepared, one each for the total field magnetics, calculated vertical gradient of the magnetic field, and VLF-EM field strength.

The total field strength will vary with the content of magnetic minerals in the underlying rocks, providing some indications of the gross geology of the area, while the calculated vertical gradient provides better definition of the contacts. The zero gradient contour will roughly define geologic contacts.

The very deep lows on the Total Field Magnetic maps are all to the immediate north of the highs. These lows reflect the dipole nature of the magnetic field and suggest that the bodies causing the highs have depth extent, and are not due to surface features such as magnetite rich volcanic flows. They do not reflect areas of strong hydrothermal alteration and consequent magnetite depletion.

The VLF-EN field strength maps reflect the conductivity of the underlying units. The pattern of their contours aides in the interpretation of geologic structure.

Copies of the contour maps prepared are attached as Figures 7 to 15. Areas of interest, the pronounced magnetic highs are detailed in Figures 16 to 18, 21 to 23, 26 to 28, and 31 to 33.

#### MINERAL DEPOSITS

No mineral deposits have been located on the Kalder Lake Project claims.

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#### RESERVES AND PRODUCTION

There are no ore reserves, nor is there any record of past production on the Kalder Lake Project.

#### DISCUSSION AND CONCLUSIONS

The geology exposed on the adjacent Tas claims, is strongly suggestive of the geology the author saw while logging core drilled from peripheral zones of the Mt Milligan copper-gold deposit in 1988 before the true bulk potential of the deposit was realized. The targets at Mt Milligan at that time were narrow sulphide/magnetite filled gold bearing shears. Subsequent work revealed the much larger bulk type deposit. A bulk copper-gold porphyry such as Mt Milligan is a realistic target on the Kalder Lake Project. The copper-gold soil anomalies are real, the low numbers associated with the anomalies is likely a reflection of overburden depth and in no way detracts from their importance, and the association with strong aeromagnetic highs makes the Kalder Lake Project highly prospective.

Four areas on the Kalder Lake Project require work. In order of priority they are:

1) the Sep 1 - Cat claim area contains a significant gold soil anomaly with supporting copper on the south side of an irregular magnetic high. See Figures 16 to 20.

2) Tez 2 claim contains a very strong, coherent magnetic high. Geochemical support is lacking as only reconnaissance soil sampling has been done, but one sample, down ice from the aeromagnetic high ran 350ppb gold. See Figures 21 to 25.

3) a strong, coherent magnetic high on the Mach claims for which complete geochemical data is lacking. See Figures 26 to 30.

4) scattered but strong gold in soil anomalies on the H+H 1 & 2 claims have some copper support, but relatively little magnetic. See Figures 31 to 35.

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MILLING ILLI 0.00 0 . . . . . . . . . 0 . . . 0 0 o  $\cap$ ----C C 00 00 0 ----13 PPM 0 - 50 51 - 75 76 - 100 101 - 125 0 0 126 - 150 SSI 0 > 150 HARDS CREW NATURAL RESOURCES LTD. BRITISH KALDER LAKE PROJECT **ANOMALY 1 AREA COPPER IN SOILS** METRES 500 JB ENGINEERING LTD. DATE MARCH 1, 1991 Contour interval 100 ft. NTS 93K/16 FIGURE AFTER SCHIMDT 20































#### RECOMMENDED WORK PROGRAM

A two stage program is recommended to investigate areas 1 and 2 above.

Stage I

Close the copper and gold in soil anomaly in area 1 and and complete a soil grid in area 2. 43km @ \$900./km all in. \$38,700.

Do reconnaissance I.P. survey on alternate soil lines, that is, on lines 400m apart. 21km @ \$1,500./km all in. \$31,500.

Diamond drilling, 2 - 150m holes into most interesting targets revealed by geochemistry and I.P. surveys. 300m @ \$160/m all in. \$48,000. Total Stage I \$118,200.

Stage II

Complete the I.P. survey work , 21km @ \$1,500./km \$31,500.

Further test geochemical and geophysical anomalies from Stage I and follow<br/>up on drill results from Stage I, 625m @ \$160/m\$100,300.<br/>\$131,800.Total Stage II\$131,800.

<u>Total</u> Program

\$250,000.

Respectfully submitted



#### CERTIFICATE

I, John Byron Richards hereby certify that:

1) I reside at 2879 West 38th Avenue in Vancouver, Canada,

2) I am a graduate of the University of British Columbia in Geological Engineering,

3) I have practised my profession more or less continuously since graduation in 1970,

4) I have been a member of the Association of Professional Engineers of the Province of British Columbia since 1973,

5) my knowledge of the Kalder Lake Project is limited to a study of available documentary data; I have not visited the property,

6) I have no interest in the claims or in Crew Natural Resources Ltd, nor do I expect to receive any interest.

7) I consent to the use of my name and this report on the Kalder Lake Project dated March 1, 1991 as part of a Statement of Material Facts by Crew Natural Resources Ltd.

Dated at Vancouver Canada, this 1st day of March 1991



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Norther Miner January 28th, 1991