Geological Report

on the Rusty Springs and Trog Claims

Dawson Mining District
NTS Map Sheets 116K08 and 116K09
Latitude 66° 30' N, Longitude 140° 25' W

Preapared For:

Eagle Plains Resources Ltd.
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Cranbrook, BC
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April, 2010

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Summary

This is an ammendment to the report submitted by R.Hodder to bring it up to compliance with the Yukon Government requirements on assessment reports. All technical information, description of the program and other pertinent data is located in the report provided by R.Hodder, found in Appendix II. Work was completed on the Trog and Rusty Springs claim blocks on July 13th, 2009.

Ternure Description

Table 1 – Tenure

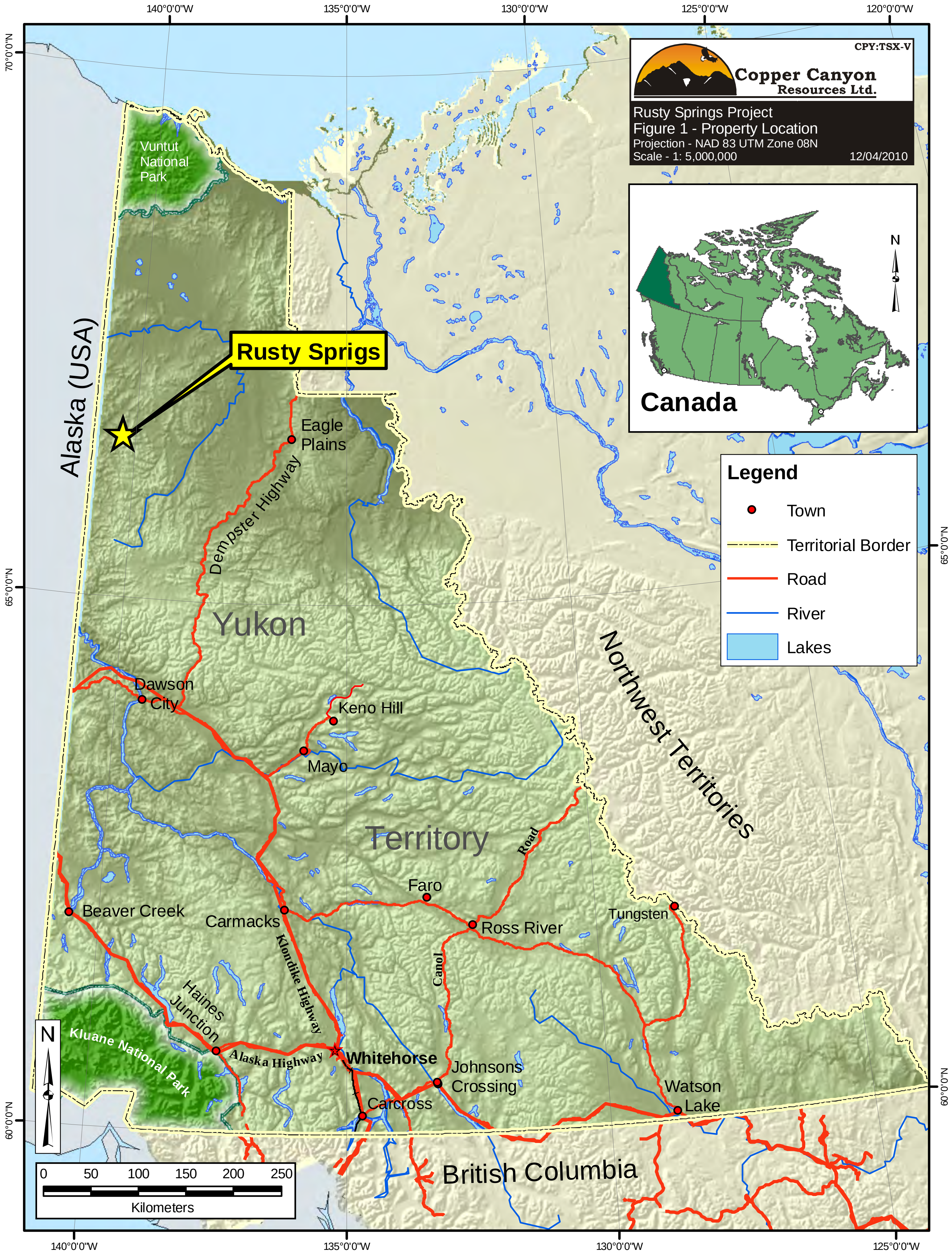
Rusty Springs

District	Grant #	Claim Name	Owner	Record Date	Expiry Date
Dawson	YB53905	Alecia	EPL	07/07/1995	10/12/2011
Dawson	YB53902	Calli	EPL	07/07/1995	10/12/2011
Dawson	YB53909	Casey	EPL	07/07/1995	10/12/2011
Dawson	YB53901	Glen	EPL	07/07/1995	10/12/2011
Dawson	YB53897	Joel	EPL	07/07/1995	10/12/2011
Dawson	YB53898	Joel	EPL	07/07/1995	10/12/2011
Dawson	YB53899	Joel	EPL	07/07/1995	10/12/2011
Dawson	YB53900	Joel	EPL	07/07/1995	10/12/2011
Dawson	YB53904	Katie	EPL	07/07/1995	10/12/2011
Dawson	YB53906	Kelsey	EPL	07/07/1995	10/12/2011
Dawson	YB53910	Lane	EPL	07/07/1995	10/12/2011
Dawson	YB53907	Lauren	EPL	07/07/1995	10/12/2011
Dawson	YB53903	Marlo	EPL	07/07/1995	10/12/2011
Dawson	YB53908	Tyler	EPL	07/07/1995	10/12/2011
Dawson	YB53912	Ben	EPL	07/07/1995	10/12/2012
Dawson	YB48768	Eric	EPL	10/06/1994	10/12/2012
Dawson	YB48769	Eric	EPL	10/06/1994	10/12/2012
Dawson	YB53914	James	EPL	07/07/1995	10/12/2012
Dawson	YB53911	Kayla	EPL	07/07/1995	10/12/2012
Dawson	YB48766	Shelly	EPL	10/06/1994	10/12/2012
Dawson	YB48767	Shelly	EPL	10/06/1994	10/12/2012
Dawson	YB53913	Trevor	EPL	07/07/1995	10/12/2012
Dawson	YB41182	Eric	EPL	29/07/1992	10/12/2013
Dawson	YB41183	Eric	EPL	29/07/1992	10/12/2013
Dawson	YB41184	Eric	EPL	29/07/1992	10/12/2013
Dawson	YB41185	Eric	EPL	29/07/1992	10/12/2013
Dawson	YB41186	Eric	EPL	29/07/1992	10/12/2013
Dawson	YB41187	Eric	EPL	29/07/1992	10/12/2013

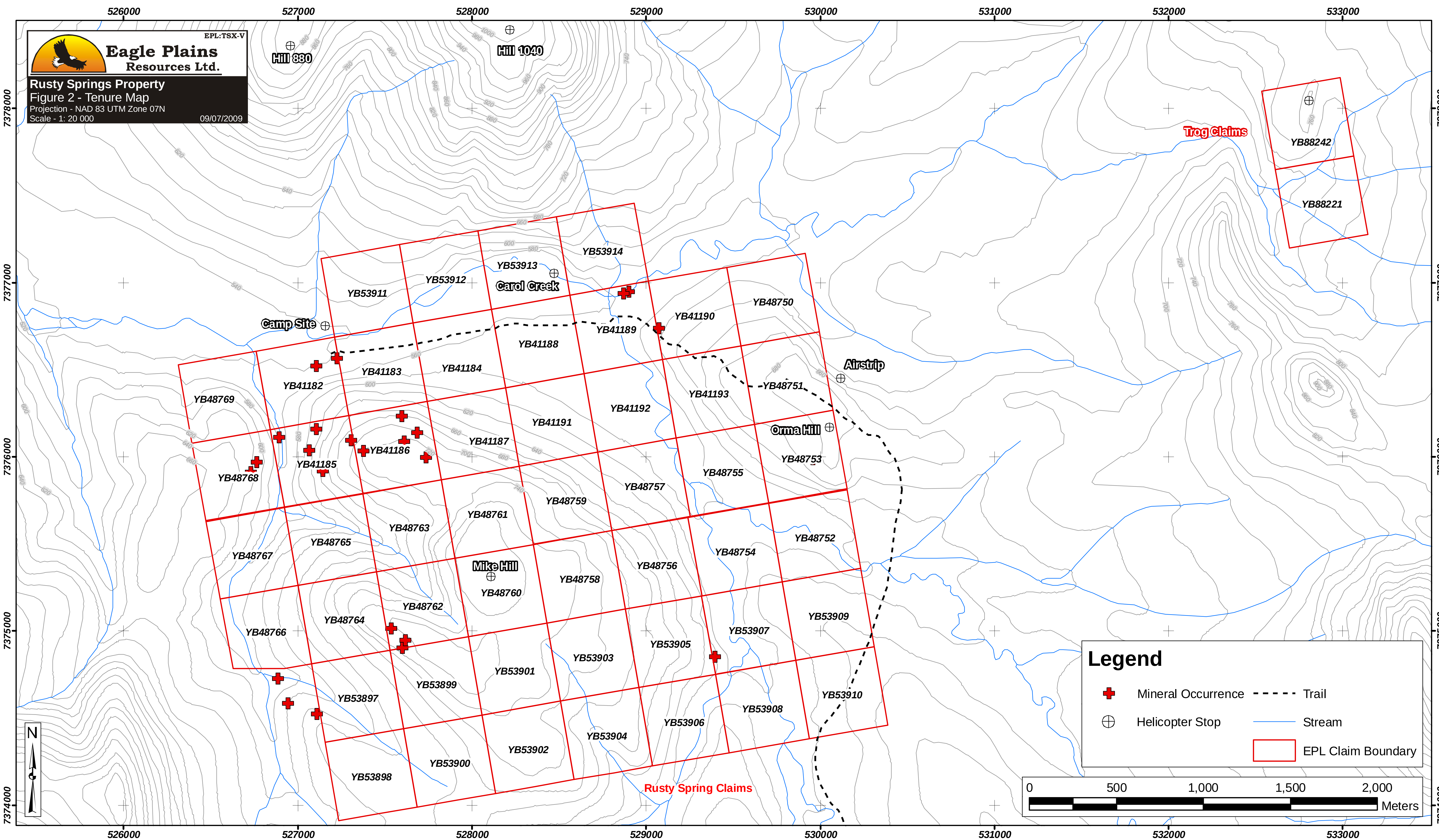
District	Grant #	Claim Name	Owner	Record Date	Expiry Date
Dawson	YB41188	Jessica	EPL	29/07/1992	10/12/2013
Dawson	YB41189	Jessica	EPL	29/07/1992	10/12/2013
Dawson	YB41190	Jessica	EPL	29/07/1992	10/12/2013
Dawson	YB41191	Jessica	EPL	29/07/1992	10/12/2013
Dawson	YB41192	Jessica	EPL	29/07/1992	10/12/2013
Dawson	YB41193	Jessica	EPL	29/07/1992	10/12/2013
Dawson	YB48750	Jessica	EPL	10/06/1994	10/12/2013
Dawson	YB48751	Jessica	EPL	10/06/1994	10/12/2013
Dawson	YB48752	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48753	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48754	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48755	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48756	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48757	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48758	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48759	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48760	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48761	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48762	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48763	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48764	Shelly	EPL	10/06/1994	10/12/2013
Dawson	YB48765	Shelly	EPL	10/06/1994	10/12/2013

Trog

District	Grant #	Claim Name	Owner	Record Date	Expiry Date
Dawson	YB88221	Trog	EPL	29/07/1996	10/12/2013
Dawson	YB88242	Trog	EPL	29/07/1996	10/12/2013



Copper Canyon Resources Ltd.
CPY:TSX-V
Rusty Springs Project
Figure 1 - Property Location
Projection - NAD 83 UTM Zone 08N
Scale - 1: 5,000,000
12/04/2010
Canada
Legend
Town
Territorial Border
Road
River
Lakes
Rusty Sprigs
Alaska (USA)
Vuntut National Park
Yukon Territory
Northwest Territories
British Columbia
Kluane National Park
Eagle Plains
Dempster Highway
Dawson City
Keno Hill
Mayo
Faro
Ross River
Beaver Creek
Carmacks
Tungsten
Klondike Highway
Canol Road
Haines Junction
Alaska Highway
Whitehorse
Johnsons Crossing
Carcross
Watson Lake
Kilometers
0 50 100 150 200 250
140°0'0"W
135°0'0"W
130°0'0"W
125°0'0"W
120°0'0"W
70°0'0"N
65°0'0"N
60°0'0"N

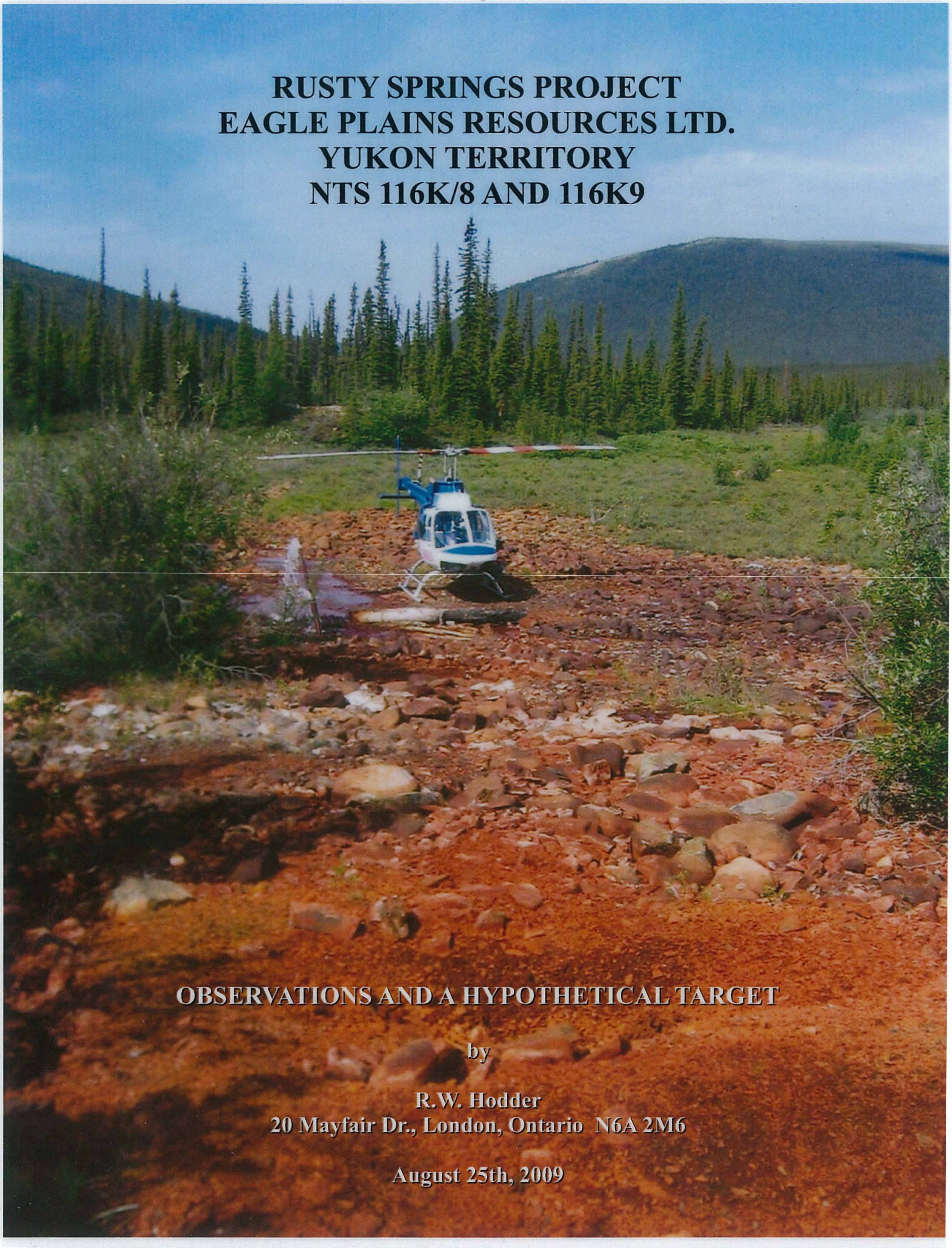


Eagle Plains Resources Ltd.
EPL:TSX-V
Rusty Springs Property
Figure 2 - Tenure Map
Projection - NAD 83 UTM Zone 07N
Scale - 1: 20 000
09/07/2009
Hill 880
Hill 1040
Trog Claims
YB88242
YB88221
Carol Creek
Camp Site
Airstrip
Orma Hill
Mike Hill
Rusty Spring Claims
YB53911
YB53912
YB53913
YB53914
YB41182
YB41183
YB41184
YB41185
YB41186
YB41187
YB41188
YB41189
YB41190
YB41191
YB41192
YB41193
YB48750
YB48751
YB48752
YB48753
YB48754
YB48755
YB48756
YB48757
YB48758
YB48759
YB48760
YB48761
YB48762
YB48763
YB48764
YB48765
YB48766
YB48767
YB48768
YB48769
YB53897
YB53898
YB53899
YB53900
YB53901
YB53902
YB53903
YB53904
YB53905
YB53906
YB53907
YB53908
YB53909
YB53910
Legend
Mineral Occurrence
Trail
Helicopter Stop
Stream
EPL Claim Boundary
0
500
1,000
1,500
2,000
Meters
N
526000
527000
528000
529000
530000
531000
532000
533000
7374000
7375000
7376000
7377000
7378000

Appendix I – Statement of Expenditures

2009 Rusty Springs Expenditures						
Exploration Work type	**Comment**	**Days**			**Totals (Rusty Springs = 94% of expenditures)**	**Totals (Trog = 6% of expenditures)**
Personnel / Position	**Field Days**	**Days**	**Rate**	**Subtotal**		
Robert Termuende, Senior Geologist	July 12-14, 2009	3	$500.00	$1,500.00		
				$1,500.00	**$1,410.00**	**$90.00**
Office Studies	**List Personnel**	**Days**	**Rate**	**Subtotal**		
Project Planning and Preparation	Robert Termuende, Senior Geologist	1.0	$500.00	$500.00		
Project Planning and	Aaron Higgs	1.0	$525.00	$525.00		
Report preparation	Aaron Higgs	1.5	$525.00	$787.50		
Report preparation	Glen/Brad	0.5	$475.00	$237.50		
				$2,050.00	**$1,927.00**	**$123.00**
Contractors				**Subtotal**		
RW Hodder, P.Geo	Field Work, Petrography, report preparation (without airfare)			$4,853.62		
				$4,853.62	**$4,562.40**	**$291.22**
Transportation		**No.**	**Rate**	**Subtotal**		
Airfare			$0.00	$0.00		
truck rental		3.00	$131.27	$393.80		
kilometers		1076.00	$0.30	$322.80		
Helicopter (hours)		3.80	$1,100.00	$4,180.00		
Fuel (litres/hour)			$0.00	$563.16		
				$5,459.76	**$5,132.17**	**$327.59**
Accommodation & Food	**Rates per day**					
Hotel		2.00	$109.00	$218.00		
Meals	$40/person/day	3.00	$80.00	$240.00		
				$458.00	**$430.52**	**$27.48**
Miscellaneous						
Geological	Plotting Geologic Maps		$0.00	$62.40		
				$62.40	**$58.66**	**$3.74**
Equipment Rentals						
Field Gear Kit		3.00	$35.00	$105.00		
Satellite Phone		3.00	$15.00	$45.00		
Hand Held Radio		3.00	$10.00	$30.00		
Computer		3.00	$10.00	$30.00		
				$210.00	**$197.40**	**$12.60**
Bootleg Exploration Admin and Handling Fees on Disbursements						
				$803.64	**$755.42**	**$48.22**
TOTAL Expenditures					**$14,473.57**	**$923.85**

Appendix II – Geological Report by R.Hodder



RUSTY SPRINGS PROJECT
EAGLE PLAINS RESOURCES LTD.
YUKON TERRITORY
NTS 116K/8 AND 116K9

OBSERVATIONS AND A HYPOTHETICAL TARGET

by

R.W. Hodder
20 Mayfair Dr., London, Ontario N6A 2M6

August 25th, 2009

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APPENDIX A

Summary of Some Carbonate-Hosted Pb-Zn-Ag Concentrations In North America's Cordillera with Possible Hypogene Nonsulphide Mineral Assemblages: Characteristics, Proposed Genesis, and Relevance to Rusty Springs

APPENDIX B

SUMMARY

The Rusty Springs lead-zinc-silver and the Alto iron prospects, plus immediate environs, were revisited on July 13th, 2009 in the company of Robert Termuende, founder of Eagle Plains Resources Ltd., and Lara Lewis of the Yukon Geological Survey. The purpose of this visit was two fold:

i) This visit was to review, on site, the nature and potential of known prospects at Rusty Springs and Alto, plus to consider additional targets based on recent thoughts of stratigraphy, structure, and metal concentration within the Northern Cordillera.

ii) This visit was to partly fulfill an assessment obligation if claims are to be retained in good standing. Obviousley, Eagle Plains Resources Ltd. is reluctant to drop the claims if additional observations may provide recommendations to further explore economic potential of known occurrences or, the district.

CONCLUSIONS

i) Neither the presently known base metal concentrations at Rusty Springs nor the magnetite at Alto have size and grade to be economic at their location, at this time. Each however may be part of a target-type not previously contemplated and that may be of economic significance.

ii) Rusty Springs has characteristics, local and regional, in common with non-sulphide zinc deposits, a deposit type attracting renewed interest but not currently explored for in the Northern Cordillera. Rationale for this exploration target is in APPENDIX A of this report.

iii) Stratigraphy and structure of the Taiga – Nahoni Fold Belt, the tectonic entity that envelopes Rusty Springs, Alto and 17 other occurrences of zinc, has not been recast into the thrust fault scenario current for the Selwyn Mountains to the south. This scenario helps explain variable thickness of section, missing section, and mappable detachement surfaces along which major translations of section have occurred and fluids have flowed to chemical and structural traps. This scenario also helps explain characteristics and genesis of nonsulphide zinc deposits.

RECOMMENDATION

i) The Rusty Springs and Alto claim groups should be retained pending a two-fold exploration effort that would require: a) A month of compilation work by one geologist. b) Three weeks of helicopter supported field work for two geologists. c) An expenditure of $150,000.

INTRODUCTION

General Statement

On Monday July 13th, 2009 Robert Termuende (Eagle Plains Resources Ltd.), Lara Lewis (Yukon Geological Survey) and myself were flown by Fireweed Helicopters from Dawson City to the airstrip on Orma Hill within the Rusty Springs claim group. This was a one and one-half hour flight under clear skies and in very light winds, both of which fortunately prevailed throughout the day until our return to Dawson City at 3:30pm. Carl, the pilot, knows the area well and provided very effective and efficient transport.

We had almost six hours at Rusty Springs in which we made stops and short walks as follows (Figures 1, 2, 3):

i) We walked along, and on the hillside northwest of the Rusty Springs airstrip, observing float of hangingwall shale and chert (7376500N, 53000E). We did not reach the significant road cuts or trenches because of dense vegetation (Figure 4).

ii) We traversed outcrops and trenches on the north knoll of Mike Hill (7375400N, 528100E). Drill core stacked here was examined as a means of reminding us of rock types and significant mineral assemblages (Figure 5).

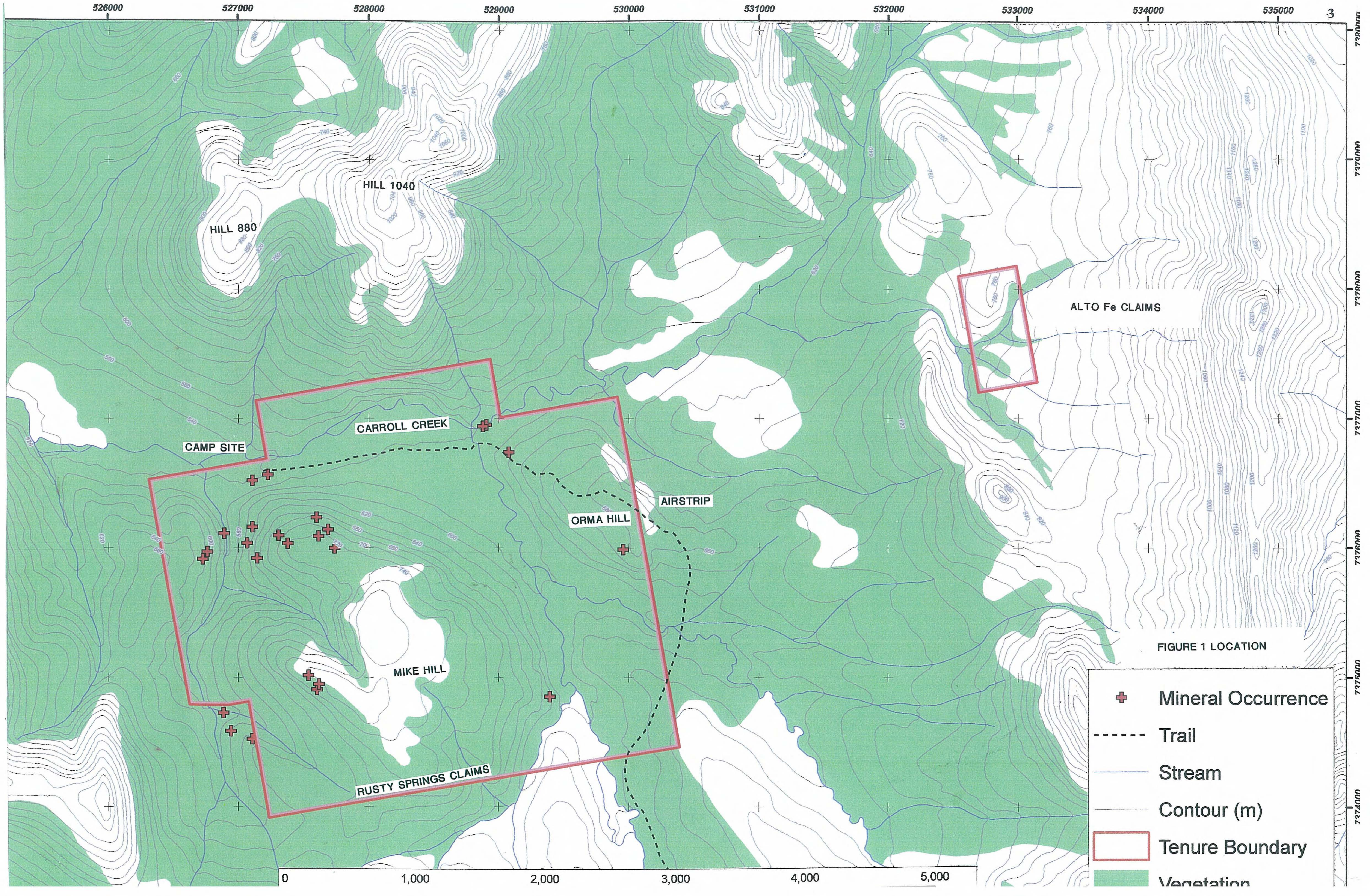
iii) We flew to the 1040 m crest of the hill north of Carroll Creek (7374000N, 526000E). We had an overview of Rusty Springs, and made a short traverse of the regional dolostone-limestone that envelopes the prospect (Figure 6).

iv) Looking west from the aforementioned 1040 m hill we saw a rusty brown layer, dipping easterly, and within dolostone on the 880 m knob two km to the northwest (7378500N, 528000E). We traversed this knob and found the rusty layer to have iron oxide and abundant quartz in common with the zinc-bearing Katshat horizon of the Rusty Springs prospect (Figure 7).

v) We went to the camp site at Rusty Springs and examined stacked drill core and selected hand specimens (7376600N, 527400E) (Cover photograph).

vi) We flew to and examined outcrops of massive magnetite at the Alto showing on the 780 m ridge three km northeast of Orma Hill (7378000N, 532800E) (Figure 8).

In accessing these sites we also had a flyby of trenches along the west side of Orma Hill (Figure 9) and northwest side of Mike Hill, the outcrops and geomorphology between Orma Hill and Alto, and an overview of the dome-like configuration of Mike Hill surrounded by topographically higher, gently outward-dipping strata (Figures 1, 9).



526000
527000
528000
529000
530000
531000
532000
533000
534000
535000
HILL 1040
HILL 880
CAMP SITE
CARROLL CREEK
AIRSTRIP
ORMA HILL
MIKE HILL
RUSTY SPRINGS CLAIMS
ALTO Fe CLAIMS
FIGURE 1 LOCATION
Mineral Occurrence
Trail
Stream
Contour (m)
Tenure Boundary
Vegetation
0
1,000
2,000
3,000
4,000
5,000

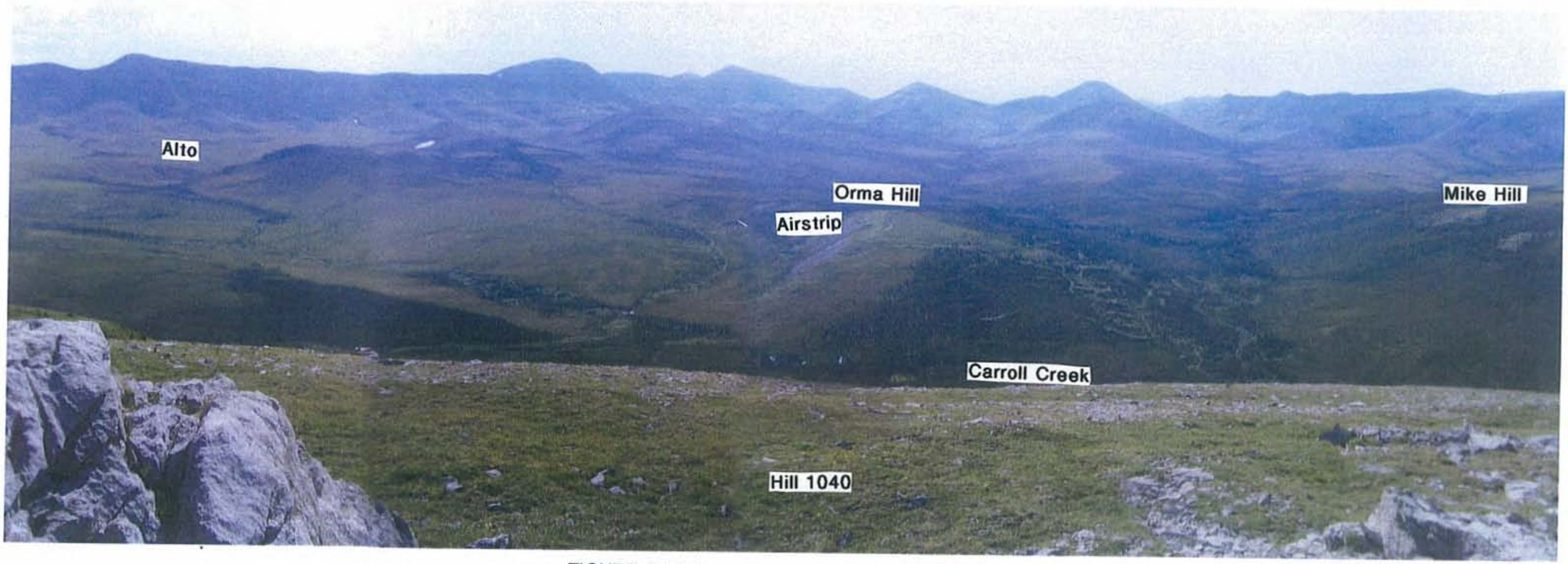


FIGURE 2 LOOKING SOUTH FROM HILL 1040

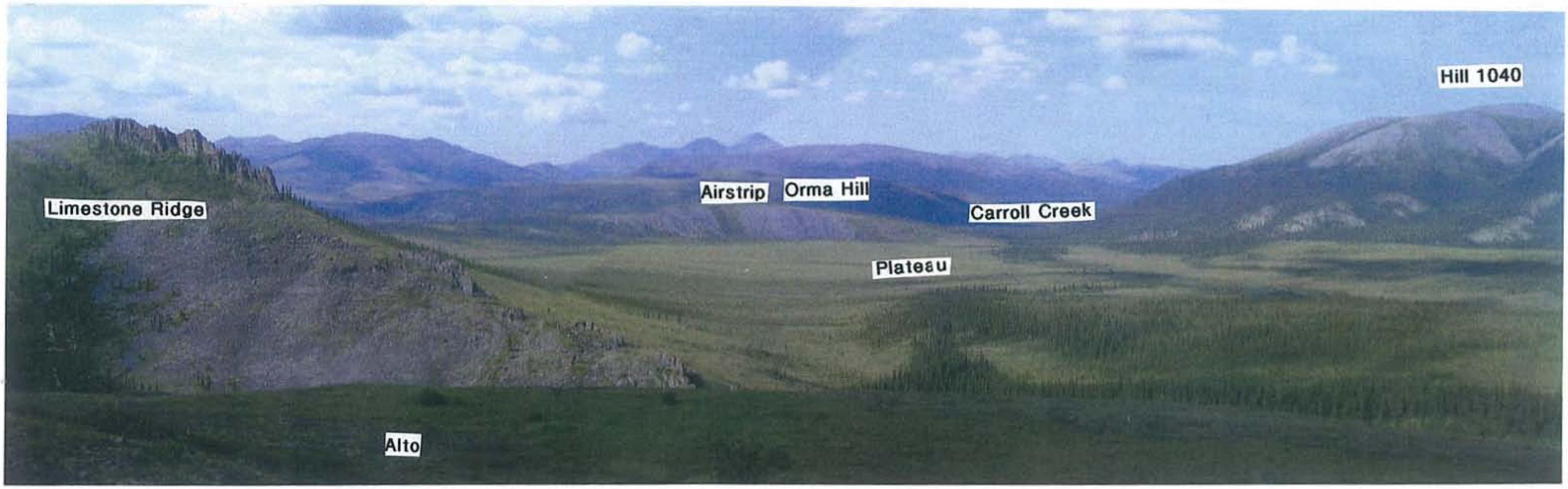


FIGURE 3 LOOKING WEST FROM ALTO Fe CLAIMS

FIGURE 4a. Orma Hill with Airstrip and Road Cuts. Looking south from Hill 1040

FIGURE4b. Vegetation on Airstrip, Orma Hill, Looking North Toward Hill 1040

FIGURE 5. Examination of Core on Mike Hill

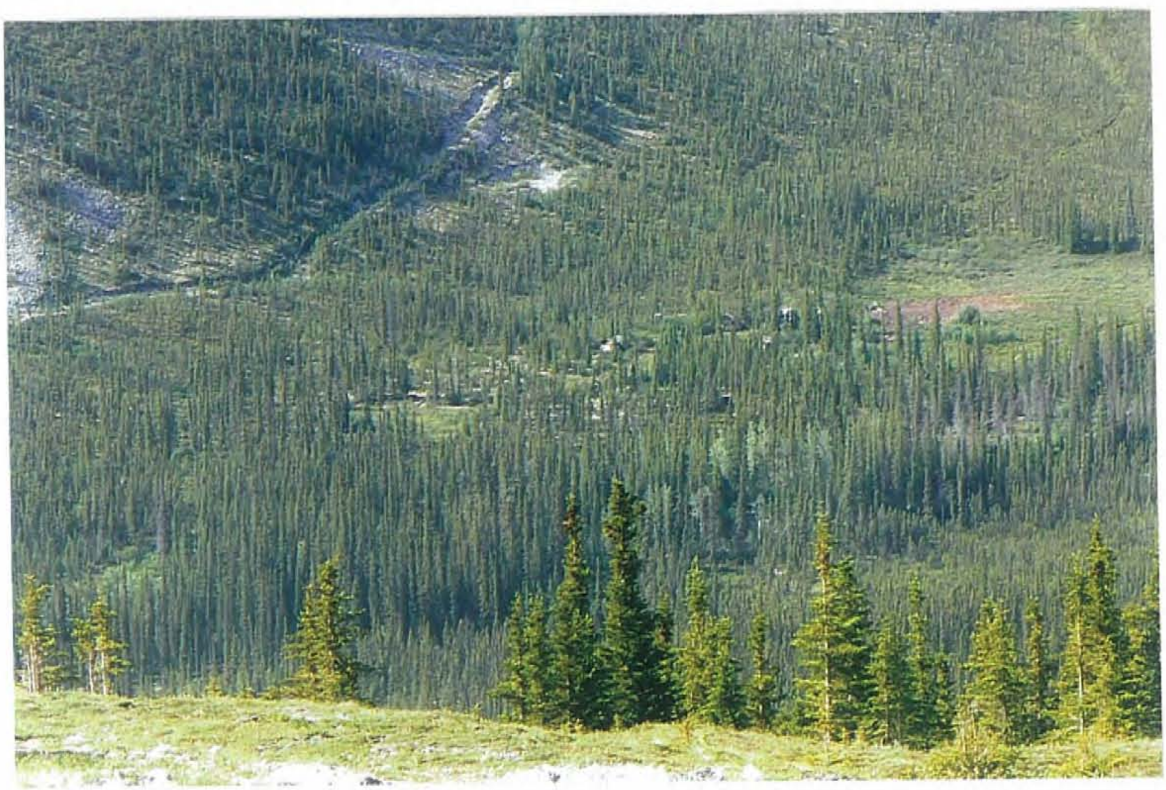


FIGURE 6. Rusty Springs and Camp Site in Carroll Creek Valley, from Hill 1040

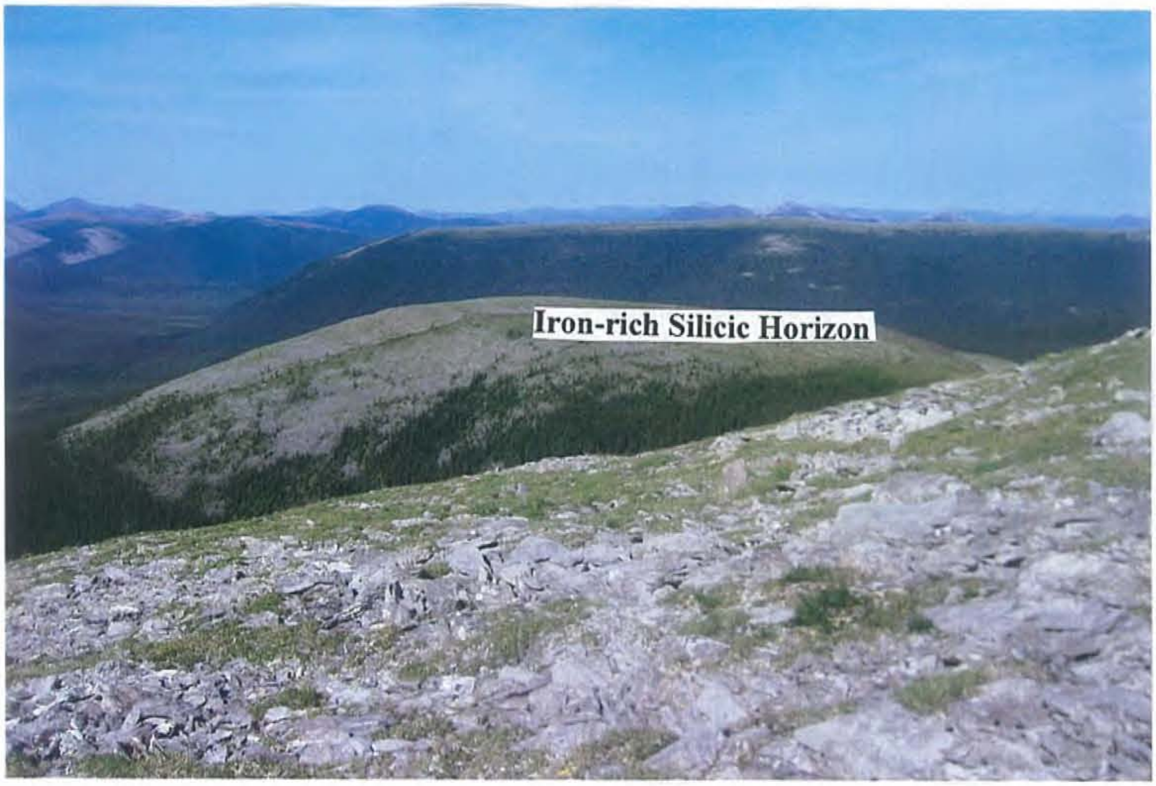


FIGURE 7a. Hill 880 in Middle Distance, Looking from Hill 1040

FIGURE 7b. Outcrop of Iron-rich Silicic Horizon on Hill 880

FIGURE 8. Outcrop of Magnetite-bearing Horizon on Alto Claims

FIGURE 9. Trenches on West Side of Orma Hill. Looking South from Hill 1040

The airstrip is wholly overgrown by chest-high fireweed, wild rhubarb, and alders at eye-level. Although conifers have not regenerated on the gravel airstrip, the other vegetation totally negates any landing by fixed-wing aircraft. Vegetation also blocked easy access to the cat road from the northwest edge of the airstrip into Carroll Creek valley and on to the old camp site. The yellow bulldozer at the airstrip is the only obvious sign of human activity as one approaches by helicopter from the south.

Purpose

Our purpose in revisiting Rusty Springs was two-fold:

1. We wanted to reconsider the nature and potential of base and precious metal concentrations at Rusty Springs in light of the following:

    i) There are new concepts on metal concentrations in fold and thrust belts of the Northern Cordillera, and there are current published regional studies of the geology. This information provides a more detailed geologic context for the Rusty Springs prospect than that available when I last visited the prospect 12 years ago.

    ii) There is a possibility that the more than forty showings at Rusty Springs can be placed in this current geologic context and used as vectors toward large, high-grade, metal concentrations.

    iii) The significance, geologically and economically, of the magnetite occurrence at Alto, only four km east of base metal prospects on Orma Hill within the Rusty Springs claim group, has not previously been considered within the geologic context of Rusty Springs.

2. We want to contribute to fulfilling assessment obligations for the claims, by observing and thinking about geology and economic potential, on site. Dropping the claims is not an option without further consideration.

The Approach

Previous reports were reviewed prior to reexamining outcrops and drill core in the filed on July 13th.

On June 15th I discussed format and substance of the assessment report with Mike Burke, Head of Mineral Services, Yukon Energy, Mines and Resources. A description of work prior to the current field examination of 2009, and a check list of required information is attached (APPENDIX B). Eagle Plains management will submit the required corporate information.

In late August I did ten hours of microscopic petrography and analyses of mineral species by electron microprobe.

What follows is a summation of previous reports, field observations, and my perspective that draws on five field seasons of exploration in the Northern Cordillera since my last presence at Rusty Springs in 1997. It is assumed that the reader has a familiarity with land status, access, work history, and general geology. These topics have been repeatedly well covered in several reports that include extensive bibliographies (Hodder, 1997, Downie and Greig, 2000, Greig, 2000, Downie, 20002, Casselman, 2006).

CURRENT OBSERVATIONS FROM FIELD, LABORATORY AND LITERATURE

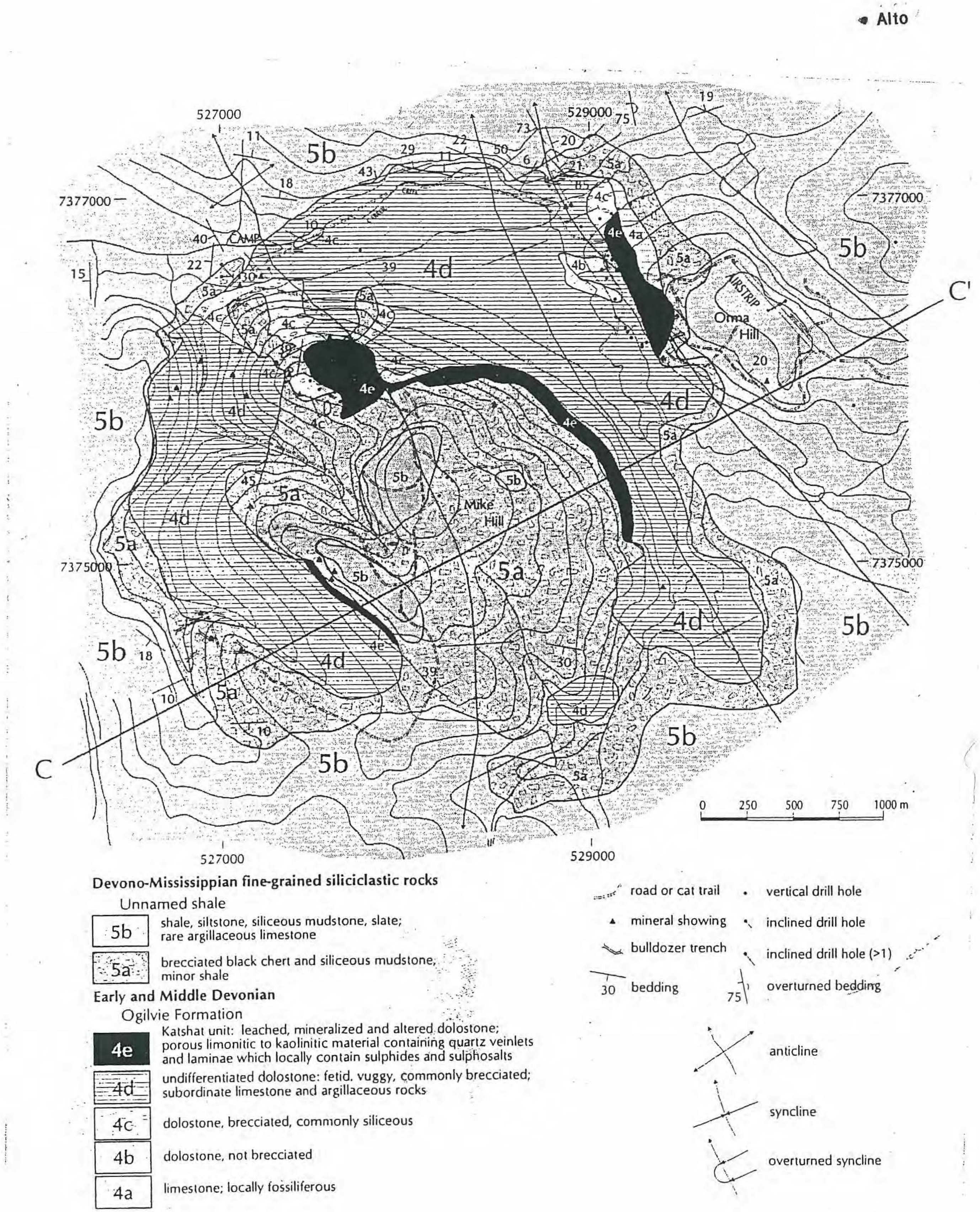
1. Known concentrations of lead-zinc-silver at Rusty Spring are stratabound within a tectono-stratigraphic interval that averages 50 m in thickness. This interval has three parts (Figure 10):

   i) A hangingwall of glassy to dull black hangingwall 'chert'. This has also been described as a silicic mudstone (Downie, 2000). It was originally included within the Hart River Formation of Early and Late Carboniferous age (Poole, 1973, Norris, 1981). Subsequently it has been assigned to the Upper Devonian Canol Formation and the Upper Devonian and Lower Carboniferous Ford Lake Shale (Norris, 1996), the Kayak Formation of similar age (Richards et al, 1996), and most recently to the Devono-Mississippian Unnamed Shale (Greig, 2000)

   This hangingwall 'chert' is up to 40 m thick, commonly a breccia with matrix plus veins and veinlets of medium to coarse-grained quartz, calcite, and dolomite. Clasts are commonly five to ten cm in diameter where observed in drill core. They generally have cuspate margins indicative of conchoidal fracture and are megascopically dense and homogeneous except for quartz on fractures and very fine-grained white mineral grains that appear to be late crystallites of quartz.

   I use 'chert' in quotation marks because I do not think it is a chert in the sense of a primary silicic biochemical sedimentary rock. I think it may be a psudotachylite, a product of cataclasis, melting, quenching, and devitrification. Such a rock has been documented on thrust faults and in shocked rocks since the late 1800's, and increasingly in fold and thrust belts around the world (Wenk, 2000). I have observed this rock on thrust faults in the Selwyn Mountains of the Yukon where they are generally hanging wall black silicic breccia in thrust zones, and are commonly base and precious metal-bearing.

   In several instances, breccia clasts, veins and veinlets are rimmed with bitumen, coarse galena, pyrite and tetrahedrite. Clasts, veins, and veinlets extend from hangingwall 'chert' downward through a local concordant to slightly discordant horizon called Katshat, and into the upper part of the footwall dolostone. Although veins and veinlets occur in 31 of 34 recorded showings in outcrop and



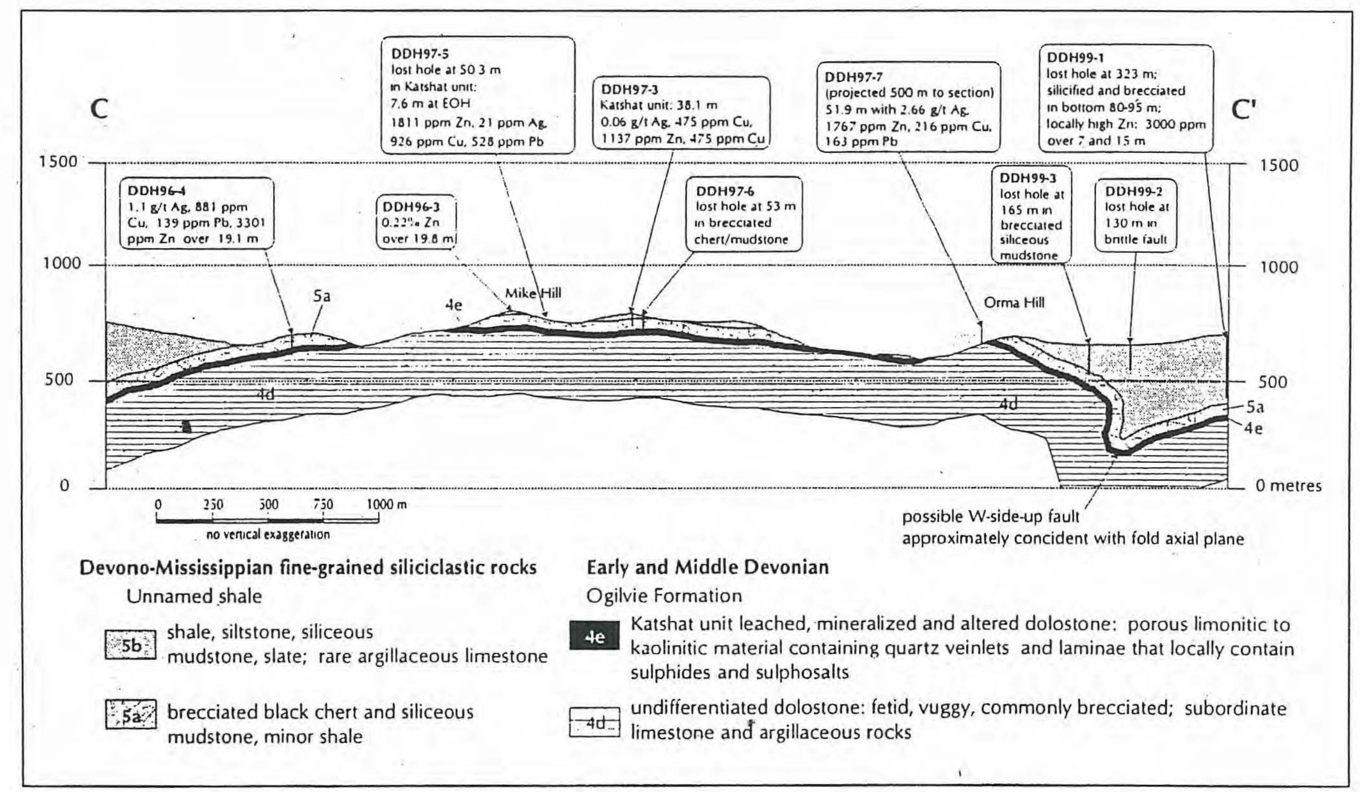


FIGURE 10 PLAN and CROSS-SECTION from GREIG, 2000

float (Downie, 1994, Hodder 1997), metal concentrations therein are relatively small and not a prime target of exploration.

ii) The Katshat horizon at Rusty Springs has the greatest potential for economic size and grade. It is mostly a brown, fine to medium-grained, semi-consolidated, mix of elongate to equi-dimensional, angular to round, clasts of black "chert" and quartz grains, elliptical aggregates of quartz grains, quartz lamellae, limonite, clay minerals, cerrusite (lead carbonate), anglesite (lead sulphate), zincite (zinc oxide), copper, lead, antimony, and arsenic oxide minerals, bitumen, and white mica (Figures 11, 12). Zinc, silver, barium, cobalt, chromium, nickel, manganese, phosphorous, tin, and mercury, are notable in whole rock analyses (Hodder, 1997), and zinc is detectable within limonite..

At some sites Katshat also has a foliation defined by a parallelism, a dimensional orientation, of elongate quartz grains. Quartz grains in some lamellae also have a common optical orientation. Some quartz grains have indented grain boundaries and some hematite and limonite of the matrix is aligned in fibers (Figure 12). Dimensional and optical orientation of quartz grains, impacting grain boundaries, and aligned mineral fibers are evidence of recrystallization under stress. The presence of these microscopic features, plus megascopic clasts of black chert and dolostone suggest that Katshat is a tectonic surface, the product of ductile (foliation and oriented quartz grains) and subsequent brittle (breccia and veinlets) deformation. I interpret Katshat as the central part of the thrust, or detachment surface of which the black 'chert' is hangingwall and brecciated dolostone is footwall.

The Katshat horizon averages 20 m thick within what has been described as a doubly plunging antiform approximately five km in diameter and centered on Mike Hill (Figure 10). There may be 200 mt of Katshat at Rusty Springs with abundances of lead, zinc, copper, and silver comparable to that encountered in drill hole intersections noted on Figure 10.

Poole (1973) and several later authors included Katshat within Carboniferous Hart River Formation Greig (2000) mapped Katshat as brecciated and oxidized dolostone at the top of Early and Middle Devonian Ogilvie Formation.

Brownish layers, rich in iron oxide minerals and quartz, and hence in this aspect similar to Katshat, outcrop in hills surrounding Rusty Springs. We visited one such layer within limestone on knob 880 north of Carroll Creek (Figure 7). It too has a foliation, elliptical aggregates of quartz grains, a limonitic matrix and veinlets and limonite after pyrite cubes (Figure 13). Another such brownish layer immediately east of the Alto magnetite occurrence has springs along its footwalls that may line up along a low-angle fault. It is suggested that these brownish layers may also be fault surfaces that developed with layer-parallel shortening during thrusting.

iii) Dolostone, footwall to Katshat, is considered local to Rusty Springs, and a

FIGURE 11. Subcrop of Katshat Horizon on Mike Hill. Massive and Botryoidal Limonite, with Clasts of Black, Glassy, "Chert".

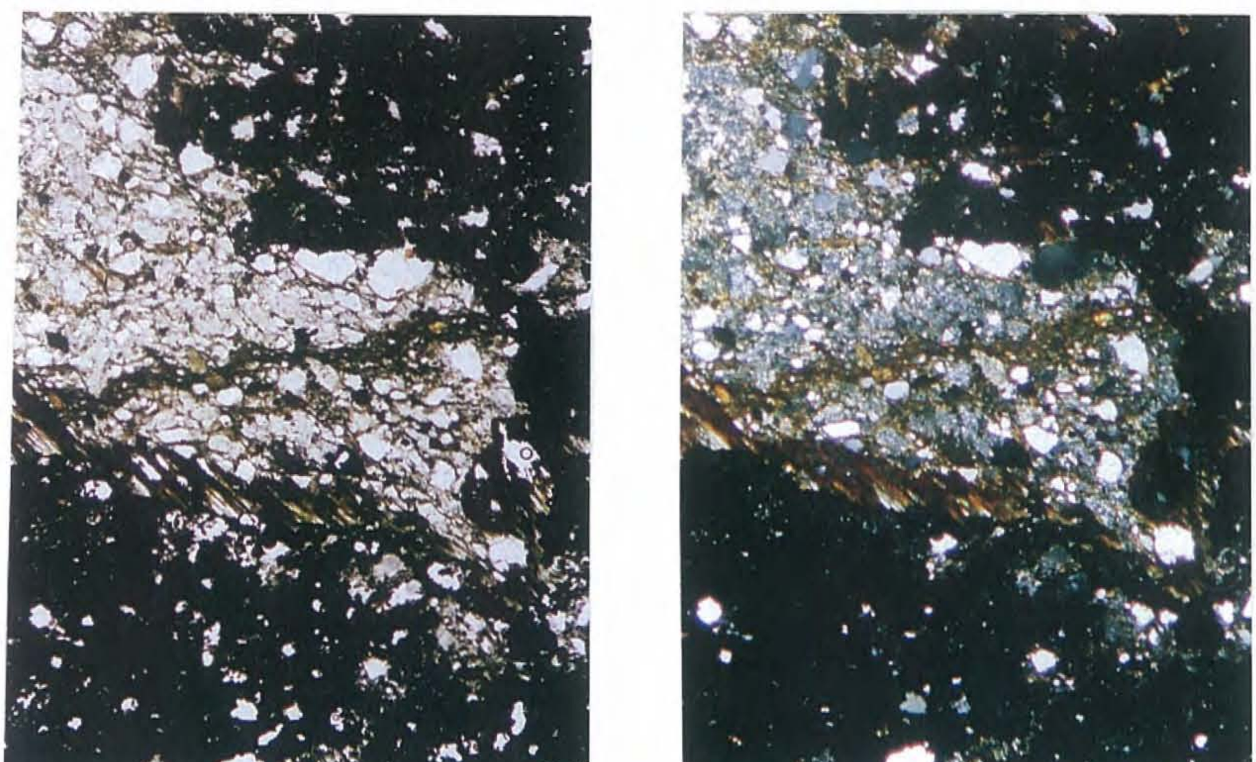


FIGURE 12. Katshat Horizon in Thin-Section.
Left, X20 in Plain Light. Right X20 in Crossed Polars.
Note Fiberous Limonite Along Edge of Clast with Quartz Fragments.

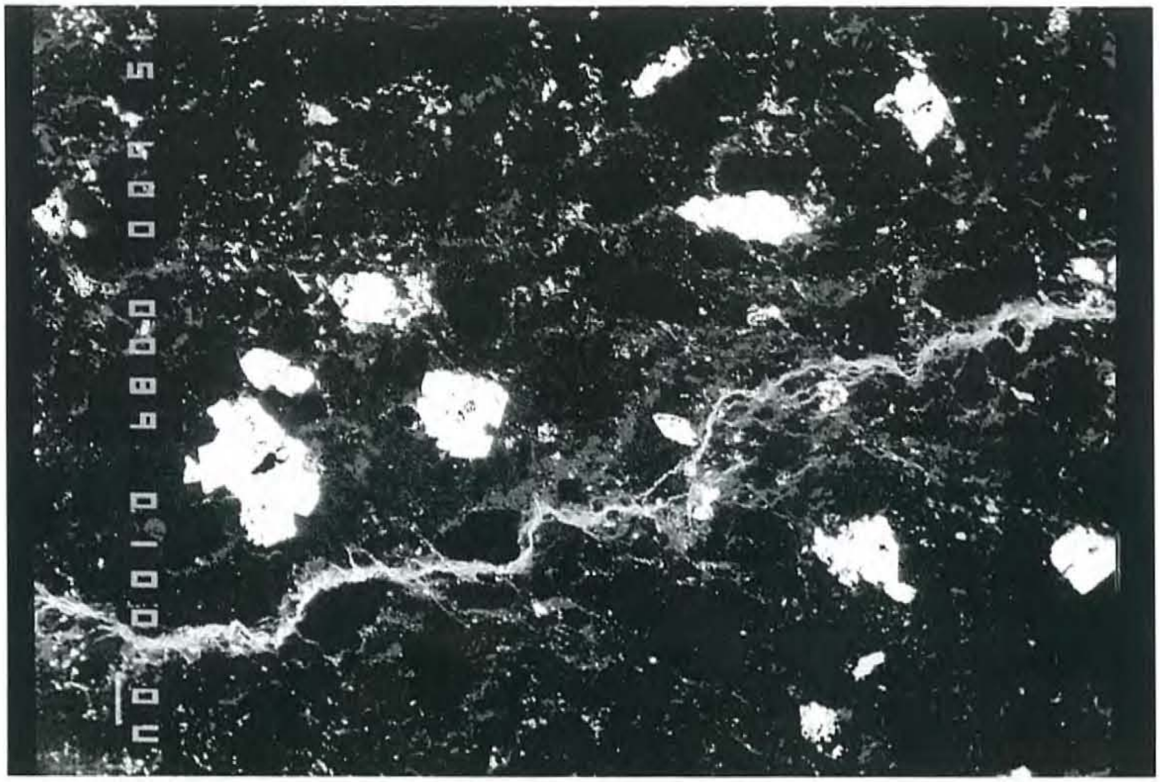


FIGURE 12b. Backscatter Image, Float of Katshat Horizon from Mike Hill. Large Bright Grains are Limonite After Pyrite and Bright Limonite Fills Fracture.

Oxide Results

	wt%	Norm wt%
SIO2	2.33	2.99
TIO2	0.00	0.00
AL2O3	1.27	1.63
CR2O3	0.03	0.04
FEO	73.47	94.37
MNO	0.14	0.17
MGO	0.07	0.09
ZNO	0.40	0.51
NIO	0.15	0.19
Total=	77.86	

Oxide Results

	wt%	Norm wt%
SIO2	2.55	3.30
TIO2	0.00	0.00
AL2O3	0.22	0.29
CR2O3	0.00	0.00
FEO	73.57	95.16
MNO	0.15	0.20
MGO	0.05	0.07
ZNO	0.63	0.81
NIO	0.14	0.18
Total=	77.31	

Oxide Results

	wt%	Norm wt%
SIO2	2.66	3.44
TIO2	0.00	0.00
AL2O3	0.17	0.21
CR2O3	0.00	0.00
FEO	73.14	94.66
MNO	0.15	0.19
MGO	0.06	0.07
ZNO	0.89	1.16
NIO	0.21	0.27
Total=	77.27	

EDS Analyses of Limonite in Fracture Of Above Image. Note Trace Zinc Content and Low Total wt%. The Latter Reflects Water Content of the Limonite

FIGURE 13a. Limonitic Horizon on Hill 880, Possible Facies of Katshat Horizon In Thin-Section: Left, X60, Aligned Quartz Grains in Plain Light. Right, X60, X-Polars

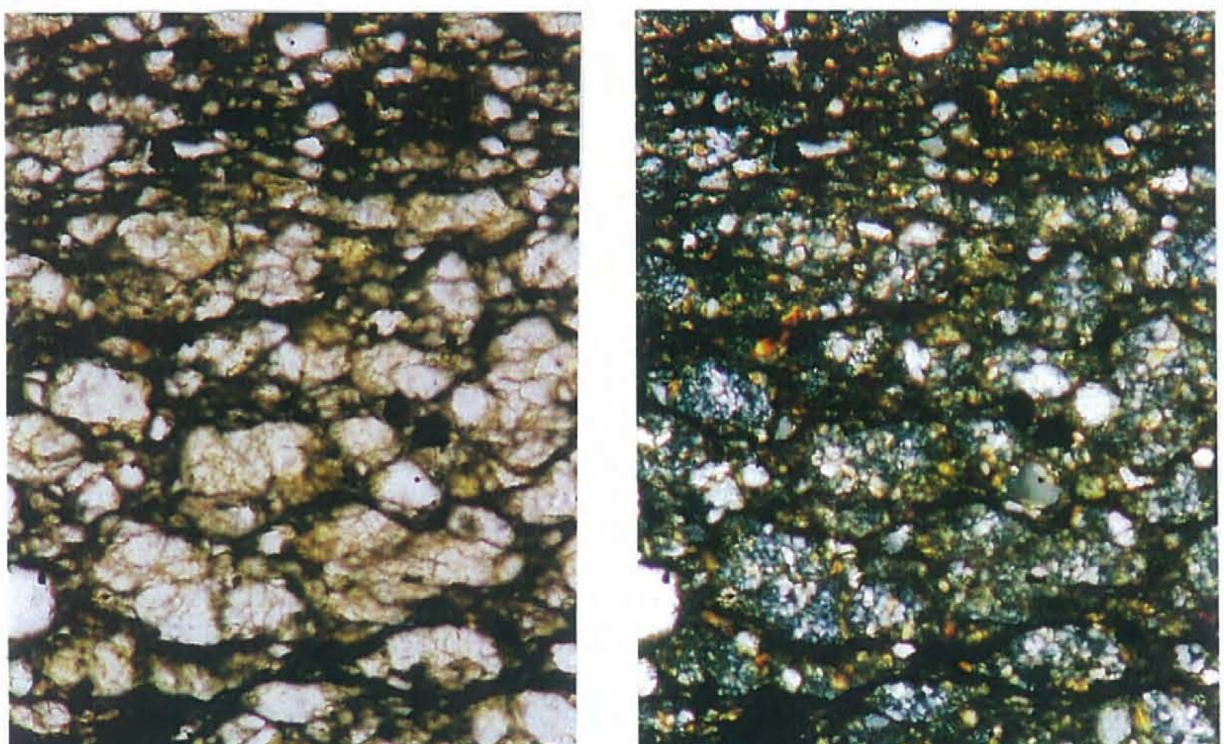


FIGURE 13b. Limonitic Horizon on Hill 880. Brightest Interior Edge on Veinlet of Hematite is Zincite. Large Rectangular Grain is Pyrite Pesudomorphed by Limonite. Backscatter Image.

facies of regionally-extensive limestone of Devonian Ogilvie formation (Norris, 1968, 1978, 1997, Greig, 2000). The dolostone is gray to black and locally divisible into a 50 m - thick upper breccia with black 'chert' clasts in a matrix of bitumen, quartz, pyrite, and scattered coarse galena and sphalerite, a vuggy middle 50 m with infills of white dolomite and calcite around 'chert' clasts (Figure 14a,b) and, a lower 65 m of black dolostone with bitumen on fractures and in vugs and an appreciable content of reefal fossil fragments.

The dolomite and calcite filling fractures with bitumen tends to be systematically zoned from clacite at the margins next to bitumen to dolomite in the center of the fracture (Figure 14c). This suggests an evolution of fluid composition through time from carbon to carbonate, and from calcium to magnesium-rich carbonate.

2. The Alto magnetite occurrence, four km northeast of the airstrip on Orma Hill, is fine-grained magnetite and lesser hematite with quartz (Figures 1, 2, 8). It outcrops as a prominent ridge striking north-northeast for 300 m and dipping steeply northwesterly. Its wall rocks are not well exposed but it does appear to be conformable within limestone. Tremuende and Downie (1997), and several other authors, follow Poole (1973) by including the Alto magnetite occurrence within the shale facies of Permian Jungle Creek Formation. Norris and Hughes (1996) places it in the Jurassic and Lower Cretaceous Kingak Formation. However, Greig (2000) includes it within the shale facies of the Devono-Mississippian Unnamed Shale Formation and, in so doing, makes it a stratigraphic equivalent to black 'chert' breccia and silicic mudstone that is hanging wall to metalliferous Katshat.

   Magnetite occurs in the core of oolites (Figure 15). Hematite flecks the magnetite in the core of oolites and makes the rims of oolites, and an iron silicate, probably chamosite, and quartz fill intersitices between oolites. The rock is not foliated and there is no evidence of deformation. However, it must have had low-grade metamorphism to reduce primary hematite oolites to magnetite, still present in the cores, that in turn has retrogressed to hematite on the rims during a late oxidation.

   The Alto magnetite occurrence, and the Rusty Springs prospect, have no expression on the aeromagnetic total field map published at 1:250,000 (Figure16). Both are however within the steep rise of magnetic contours from the low within 57700 that parallels the Salmon River in the west, to the high of 58040 northwest of Bear Cave Mountain and the right-angle bend in Fishing Branch River to the east. In My interpretation this represents a front of oxidation and a trend to be explored.

3. As noted above, there is controversy about local stratigraphy and structure at Rusty Springs. Such controversy is common within the Northern Cordillera where, in the 1970's, a biostratigraphy was developed from large-scale regional mapping and widespread type sections with fossil assemblages. This was the nadir of syngenesis for mineral deposits. Emphasis at that time was on understanding the site of primary sedimentary deposition of rocks and metals in basins. Less

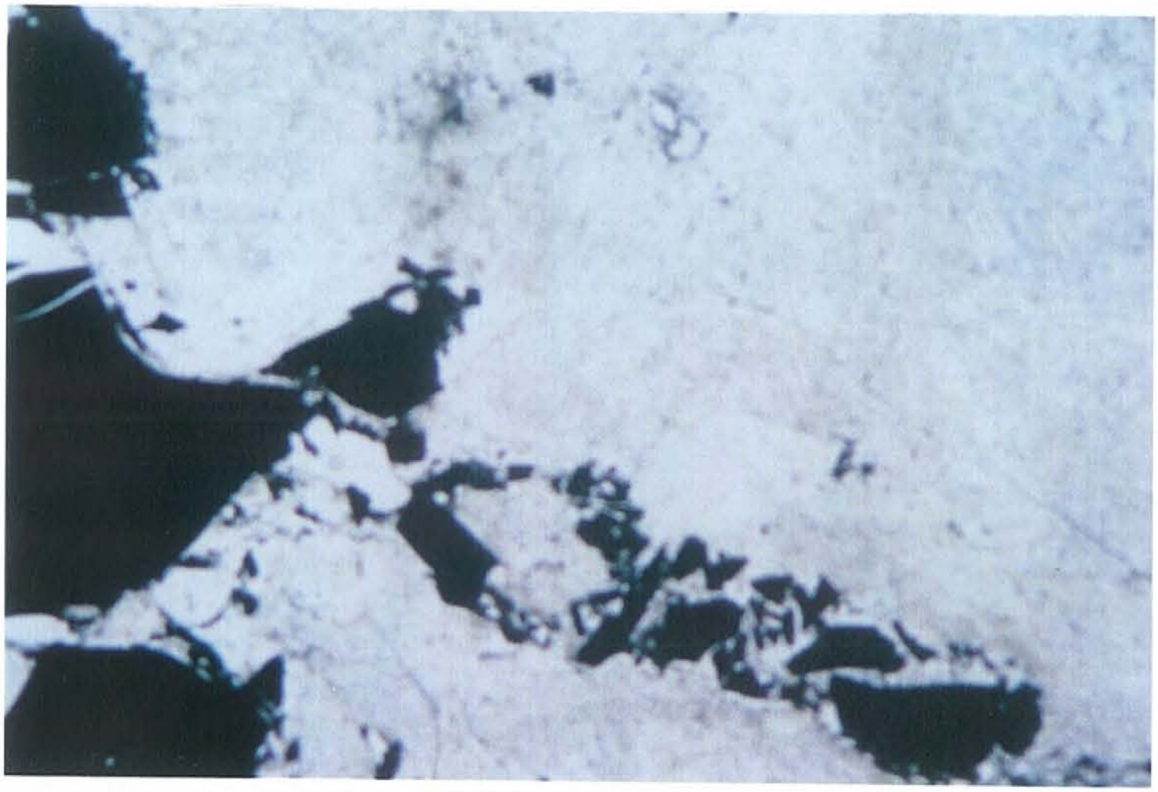


FIGURE 14a. Thin-Section of Dolomite and Calcite Matrix to Black 'Chert'. Footwall to Katchat, Mike Hill. X20, Plain Light. Drill Core Through Katshat Horizon and into Footwall Dolostone, Mike Hill.

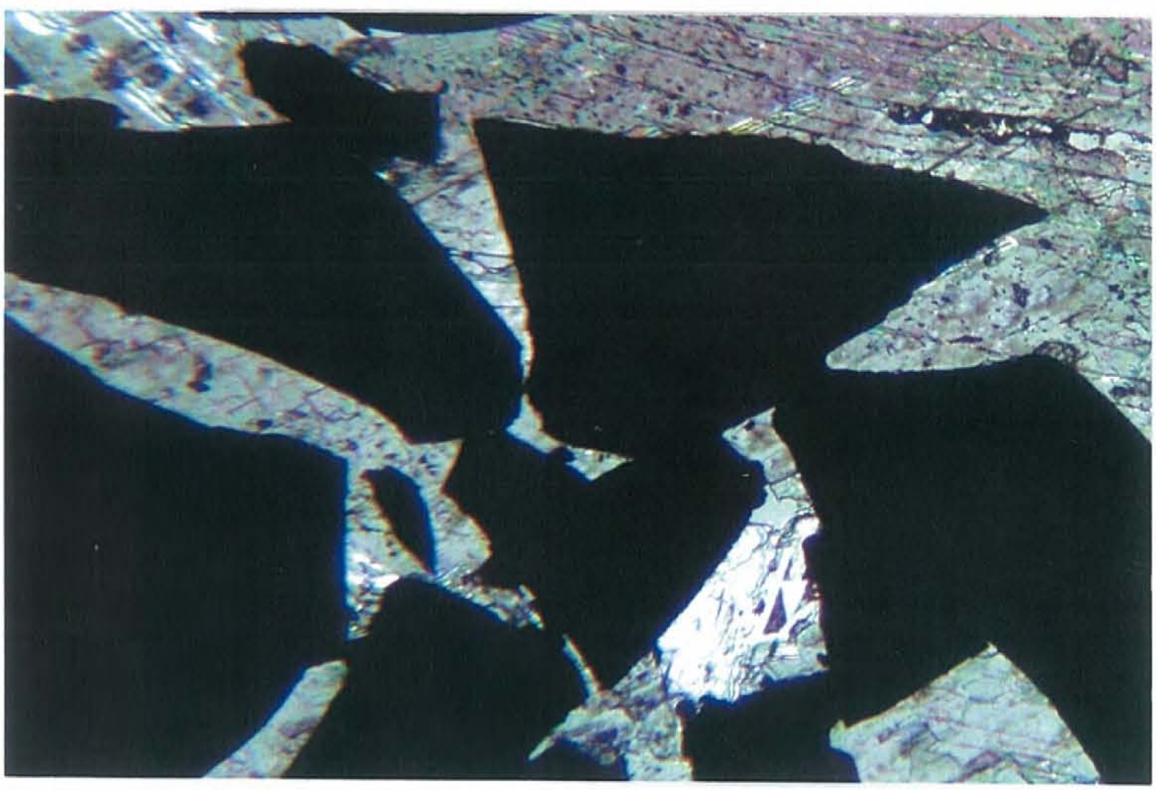


FIGURE 14b. Thin-Section of Dolomite and Calcite Matrix to Black 'Chert'. Footwall to Katchat, Mike Hill. X20, Crossed Polars. Drill Core Through Katshat Horizon and into Footwall Dolostone, Mike Hill.

FIGURE 14C. Backscatter Image of Calcite (white) between Carbon (black) and Zoned Dolomite (gray).

Oxide Results	wt%	Norm wt%
SIO2	0.00	0.00
TIO2	0.00	0.00
AL2O3	0.00	0.00
CR2O3	0.00	0.00
FEO	0.00	0.00
MGO	22.26	44.99
MNO	0.00	0.00
CAO	27.21	54.99
BAO	0.00	0.00
K 2O	0.00	0.00
NA2O	0.00	0.00
F	0.01	0.02
CL	0.00	0.00
Total=	49.49	

Oxide Results	wt%	Norm wt%
SIO2	0.00	0.00
TIO2	0.00	0.00
AL2O3	0.34	0.61
CR2O3	0.00	0.00
FEO	0.00	0.00
MGO	24.40	43.01
MNO	0.00	0.00
CAO	31.95	56.32
BAO	0.00	0.00
K 2O	0.00	0.00
NA2O	0.03	0.06
F	0.00	0.00
CL	0.00	0.00
Total=	56.73	

Oxide Results	wt%	Norm wt%
SIO2	0.00	0.00
TIO2	0.00	0.00
AL2O3	0.00	0.00
CR2O3	0.00	0.00
FEO	0.00	0.00
MGO	24.86	42.50
MNO	0.02	0.04
CAO	33.59	57.42
BAO	0.00	0.00
K 2O	0.01	0.02
NA2O	0.01	0.01
F	0.00	0.00
CL	0.01	0.01
Total=	58.49	

Oxide Results	wt%	Norm wt%
SIO2	0.00	0.00
TIO2	0.00	0.00
AL2O3	0.00	0.00
CR2O3	0.00	0.00
FEO	0.00	0.00
MGO	0.08	0.15
MNO	0.06	0.12
CAO	52.56	99.70
BAO	0.00	0.00
K 2O	0.01	0.01
NA2O	0.00	0.00
F	0.00	0.00
CL	0.01	0.02
Total=	52.71	

EDS Analyses of Zoned Dolomite in Above Image from Least Mgo to Most Mgo, Right to Left.

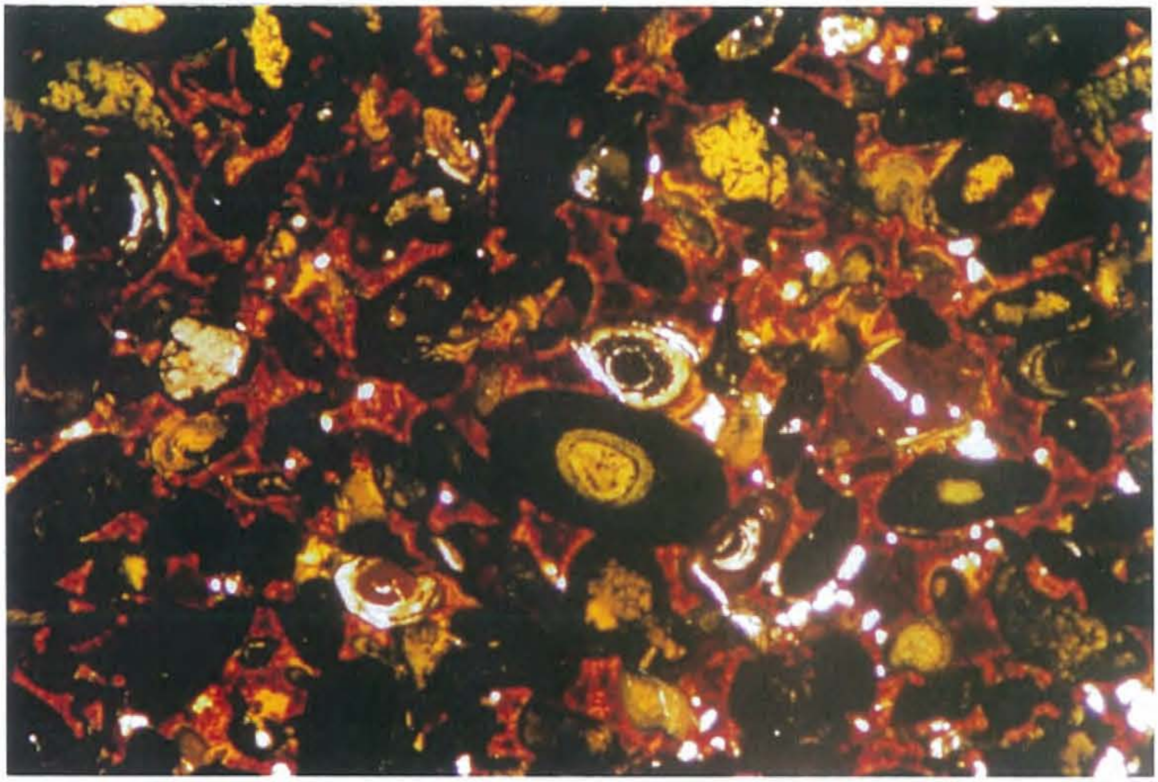


FIGURE 15a. Thin-Section of Oolitic Alto Ironstone. X20, Plain Light.

FIGURE 15b. Backscatter Image of Oolitic Alto Ironstone.

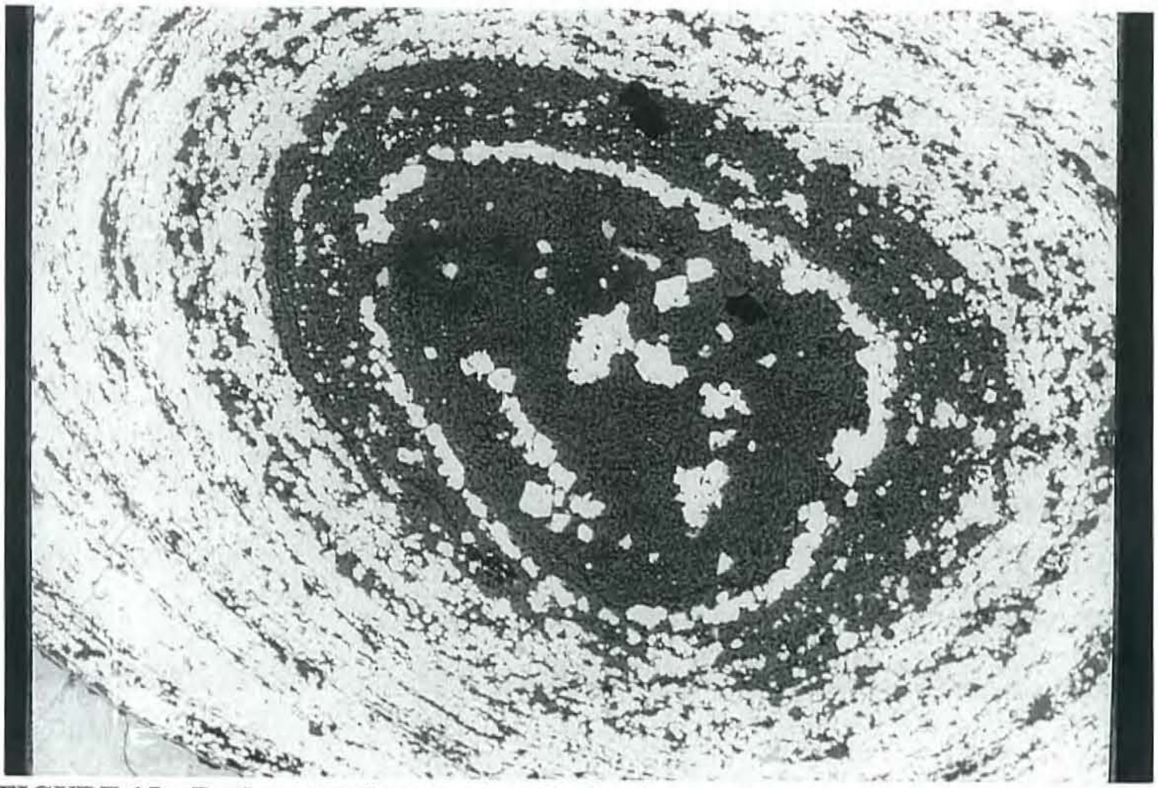


FIGURE 15c. Backscatter Image of an Oolite of Alto Ironstone with Central Bright Spots of Iron Silicate, probably Chamosite.

i)

Oxide Results

	wt%	Norm wt%
SIO2	18.80	21.37
TIO2	0.12	0.14
AL2O3	14.96	17.01
CR2O3	0.08	0.09
FEO	52.23	59.38
MGO	0.58	0.66
MNO	0.03	0.03
CAO	0.18	0.20
BAO	0.08	0.10
K 2O	0.06	0.07
NA2O	0.01	0.01
F	0.80	0.91
CL	0.02	0.03
Total=	87.96	

ii)

Oxide Results

	wt%	Norm wt%
SIO2	1.72	1.99
TIO2	0.00	0.00
AL2O3	0.68	0.79
CR2O3	0.02	0.03
FEO	84.02	96.95
MNO	0.07	0.08
MGO	0.00	0.00
ZNO	0.00	0.00
NIO	0.14	0.16
Total=	86.66	

Oxide Results

	wt%	Norm wt%
SIO2	0.55	0.60
TIO2	0.00	0.00
AL2O3	0.18	0.20
CR2O3	0.04	0.04
FEO	89.86	98.85
MNO	0.14	0.16
MGO	0.00	0.00
ZNO	0.00	0.00
NIO	0.14	0.15
Total=	90.91	

Oxide Results

	wt%	Norm wt%
SIO2	1.46	1.53
TIO2	0.02	0.02
AL2O3	0.07	0.08
CR2O3	0.02	0.02
FEO	93.52	98.00
MNO	0.14	0.15
MGO	0.00	0.00
ZNO	0.00	0.00
NIO	0.20	0.21
Total=	95.43	

Oxide Results

	wt%	Norm wt%
SIO2	0.11	0.12
TIO2	0.00	0.00
AL2O3	0.07	0.08
CR2O3	0.03	0.03
FEO	95.55	99.26
MNO	0.25	0.26
MGO	0.00	0.00
ZNO	0.00	0.00
NIO	0.25	0.26
Total=	96.26	

iii)

Oxide Results

	wt%	Norm wt%
SIO2	22.24	25.66
TIO2	0.08	0.09
AL2O3	17.89	20.64
CR2O3	0.14	0.16
FEO	44.47	51.30
MGO	0.70	0.81
MNO	0.10	0.12
CAO	0.18	0.21
BAO	0.00	0.00
K 2O	0.05	0.06
NA2O	0.03	0.03
F	0.77	0.89
CL	0.02	0.02
Total=	86.68	

EDS Analyses of Oolites, i) Hematite, ii) Increasingly Iron-rich Magnetite, and iii) Chamosite.

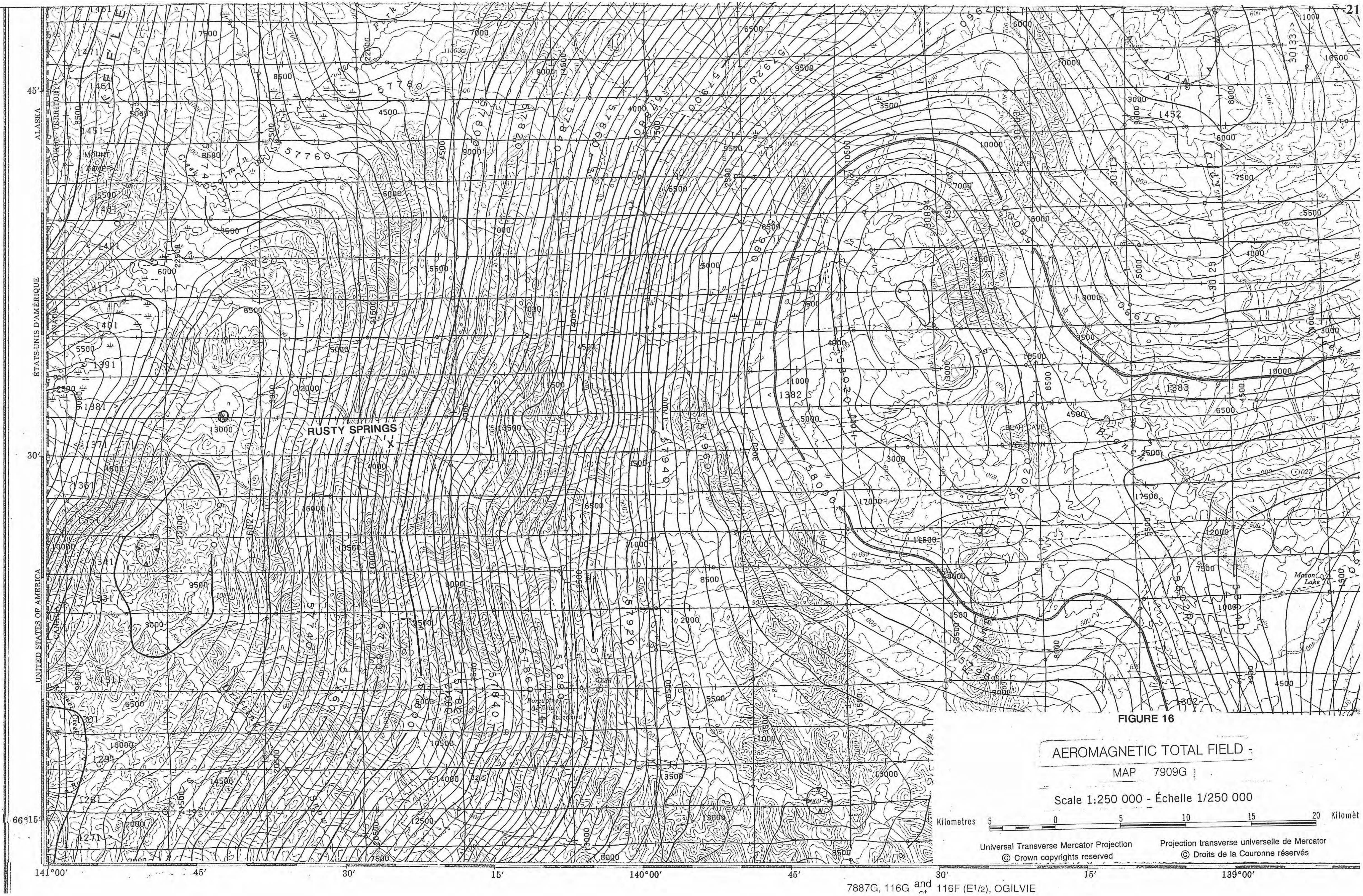


FIGURE 16

AEROMAGNETIC TOTAL FIELD -
MAP 7909G

Scale 1:250 000 - Échelle 1/250 000

emphasis was placed on post-depositional deformation and what this did to stratigraphy and metallogenesis. In most instances, issues of variable thickness, apparent facies changes, slightly discordant metal concentrations, etc. were resolved by interpretation of large-scale folds.

It was not until the 1990's, following detailed work in the Southern Cordillera, that geologists working in the Northern Cordillera began to fully realize that primary rock distribution in the Paleozoic basins had been so drastically modified into fold and thrust belts during Mesozoic and Cenozoic orogeny (Mair et al, 2006). We have come to appreciate the nature of the thrusting, particularly the results of attendant major detachments that cut out section, double section, and make difficult-to-explain epigenetic mineral deposits.

It is obvious to me now, that during my first visit to Rusty Springs twelve years ago, I was too myopic, too focused on drill hole intersections, too focused on making something of the known prospect, and not sufficiently attentive to regional structural-stratigraphic relationships, and unconventional interpretations of the type of major deposit that could be present.

I now hypothesize, after five consecutive years exploring in the Northern Cordillera and studying the nature of thrust faulting therein, that the Katshat horizon is on a detachment surface within a thrust complex, and that the Alto magnetite occurrence and similar-looking material on hill 880 may be a faulted lateral facies of the Katshat horizon.

A HYPOTHETICAL TARGET

General Statement

Metal concentrations in black mudstones on detachment surfaces, and on S/C fabrics between detachment surfaces, that is in fabrics characteristic of shear zones, are reasonably well documented in the Northern Cordillera as at Red Dog in the Brooks Range of Alaska. In other deposits within the Cordillera, metals are in mixed sulphide, oxide, carbonate, and silicate mineral species. I think Rusty Springs has many of the characteristics of a mixed sulphide and nonsulphide type of base metal occurrence.

Although I do not think Rusty Springs can be economic in itself, I do think it is of sufficient size, grade, and character to warrant exploration in the district for a nonsulphide zinc-lead deposit with appreciable silver.

Non-Sulphide Zinc Deposits

Historical Perspective

Exploration for non-sulphide zinc deposits, or as they are also called in the literature 'oxide' zinc deposits, is actually a step back in history into a search for a deposit type that once produced most of the world's zinc as smithsonite ($ZnCO_3$). In the 1800's the practice was to drive off CO_2 in Wälz kilns and recover the Zn. Smithsonite generally contained less than 20% zinc and the process was difficult (Hitzman et al, 2003). Zinc sulphide, sphalerite (ZnS) with 67% zinc, was not the dominant ore mineral until the early 1900's when froth flotation was invented and was able to make a sphalerite concentrate. This concentrate went to a smelter where sulphur was driven by heating, leaving zinc metal.

The interest in non-sulphide zinc has been regenerated with the advent of hydrometallurgy, solvent extraction by acid-leaching and pure metal production by electrowinning. This process can take place at mine site and is cheaper than conventional milling and smelting. It does however have higher capital costs, requires cheap electricity, and does not necessarily optimize lead and silver recovery.

The General Case

There are two types of non-sulphide zinc deposits (Sangster, 2003, Hitzman, 2003) (Figure 17):

1. **Supergene deposits** are the most common type. They are secondary smithsonite ($ZnCO_3$), hemimorphite ($Zn_4Si_2O_7(OH)_2.H_2O$), and hydrozincite ($Zn_5(CO_3)_2(OH)_6$ and sauconite, the complex zinc-bearing clay mineral (Figure 18). Supergene deposits result from: i) Weathering and direct replacement of a sulphide body to make a zinc-rich gossan. ii) By wall rock replacement. iii) By transporting the products of weathering in solution and precipitating them as cave fill in karst cavities (Figure 19). The first type is vuggy, silicic, limonitic and hematitic. The second type tends to have a simple mineral assemblage, be high grade, and layered. The third type tends to have appreciable sauconite along with smithsonite, hemimorphite, and hydrozincite.

2. **Hypogene deposits** consist of primary willemite (Zn_2SiO_4) or willemite with franklinite and minor sphalerite. There are two sub-types (Figure 20):

   i) Discordant veins and pipe-like bodies called chimneys. These are structurally controlled concentrations of willemite with hematite, sphalerite, and hydrothermal dolomite.

   ii) Concordant, stratiform bodies of willemite, franklinite, zincite, and ghanite the zinc spinel. Both sub-types are interpreted as products of low-temperature hydrothermal fluids, in the instance of the former a reduced fluid that precipitates zinc minerals when it encounters a reductant. The latter precipitants from a reduced, but

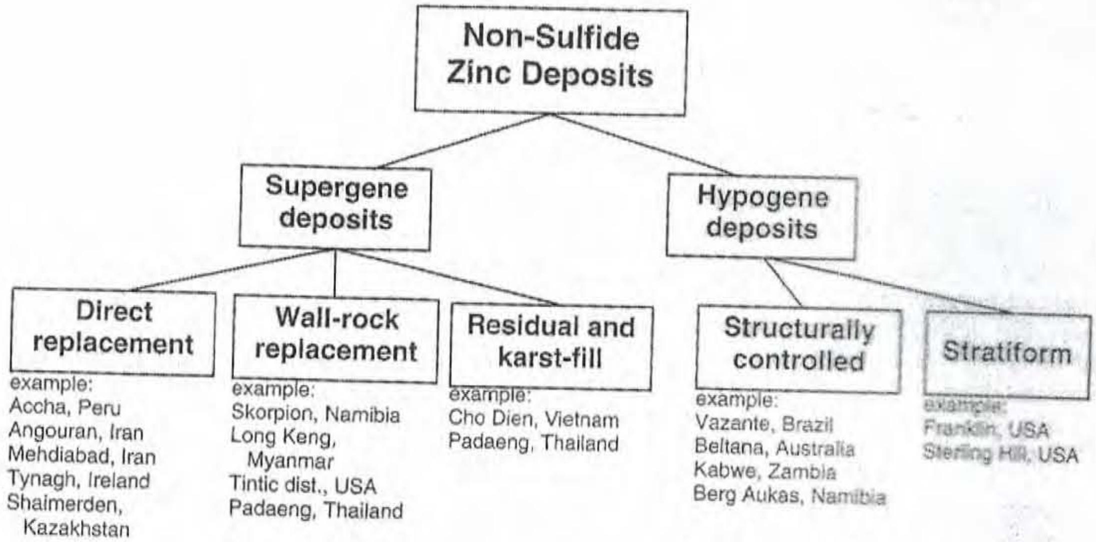


FIGURE 17. Supergene versus Hypogene Nonsulphide Zinc Deposits, from Hitzman et al, 2003

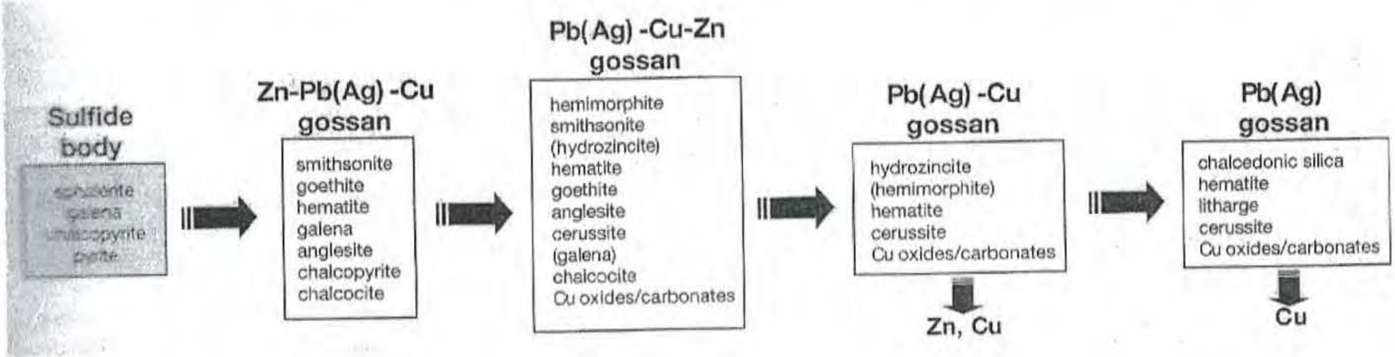


FIGURE 18a. Minerals in a Supergene Sulphide Replacement Nonsulphide Zinc Deposit, from Hitzman et al, 2003

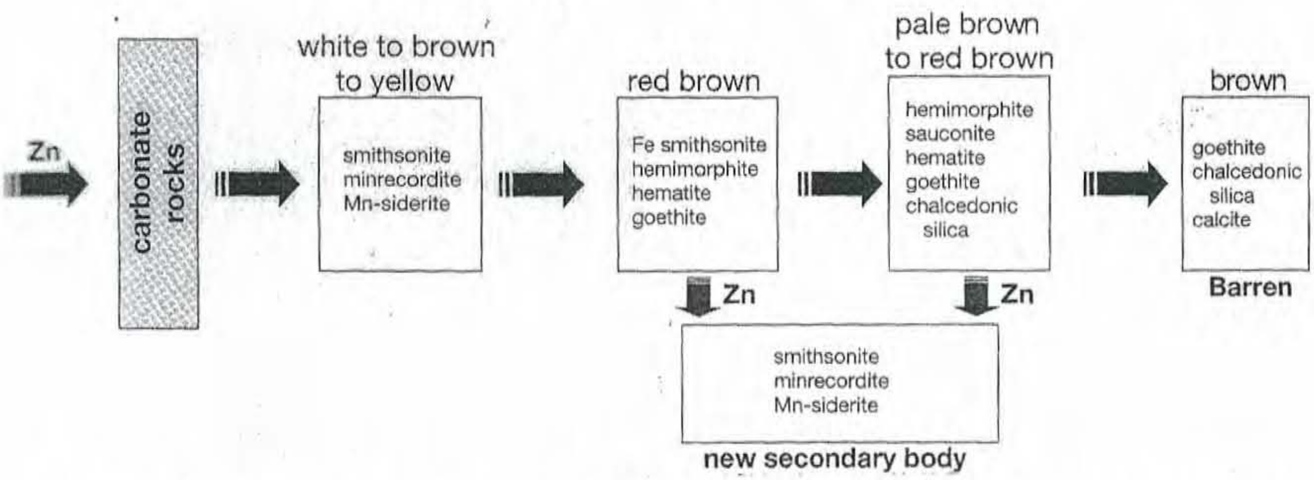


FIGURE 18b. Minerals in a Supergene Wall Rock-Replacement Nonsulphide Zinc Deposit From Hitzman et al, 2003

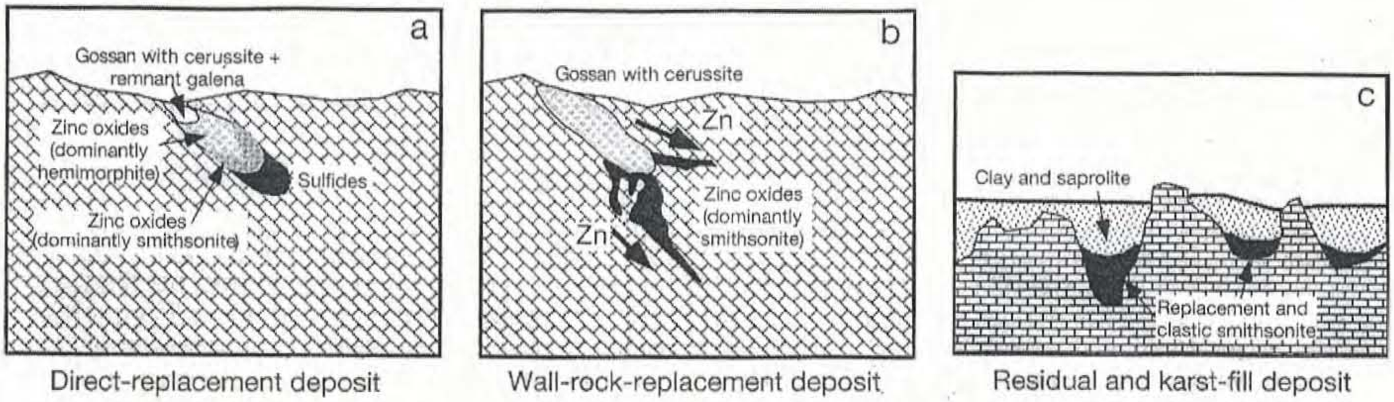


FIGURE 19. Form of Supergene Nonsulphide Zinc Deposits, from Hitzman et al, 2003

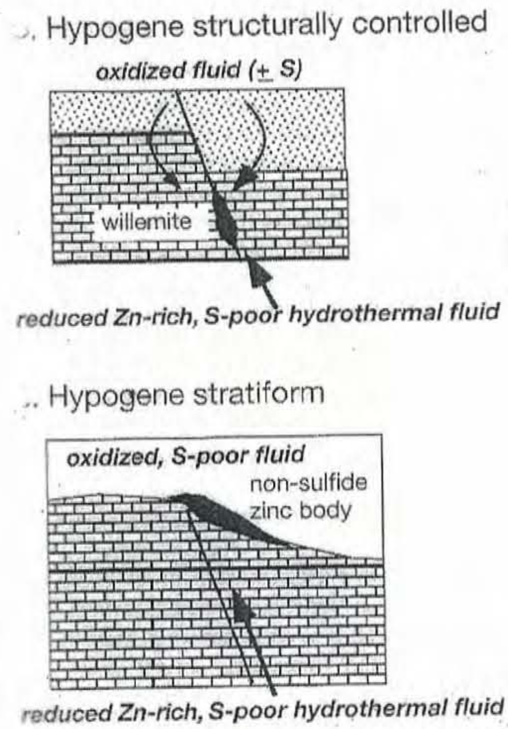


FIGURE 20. From of Hypogene Nonsulphide Zinc Deposit, from Hitzman et al, 2003

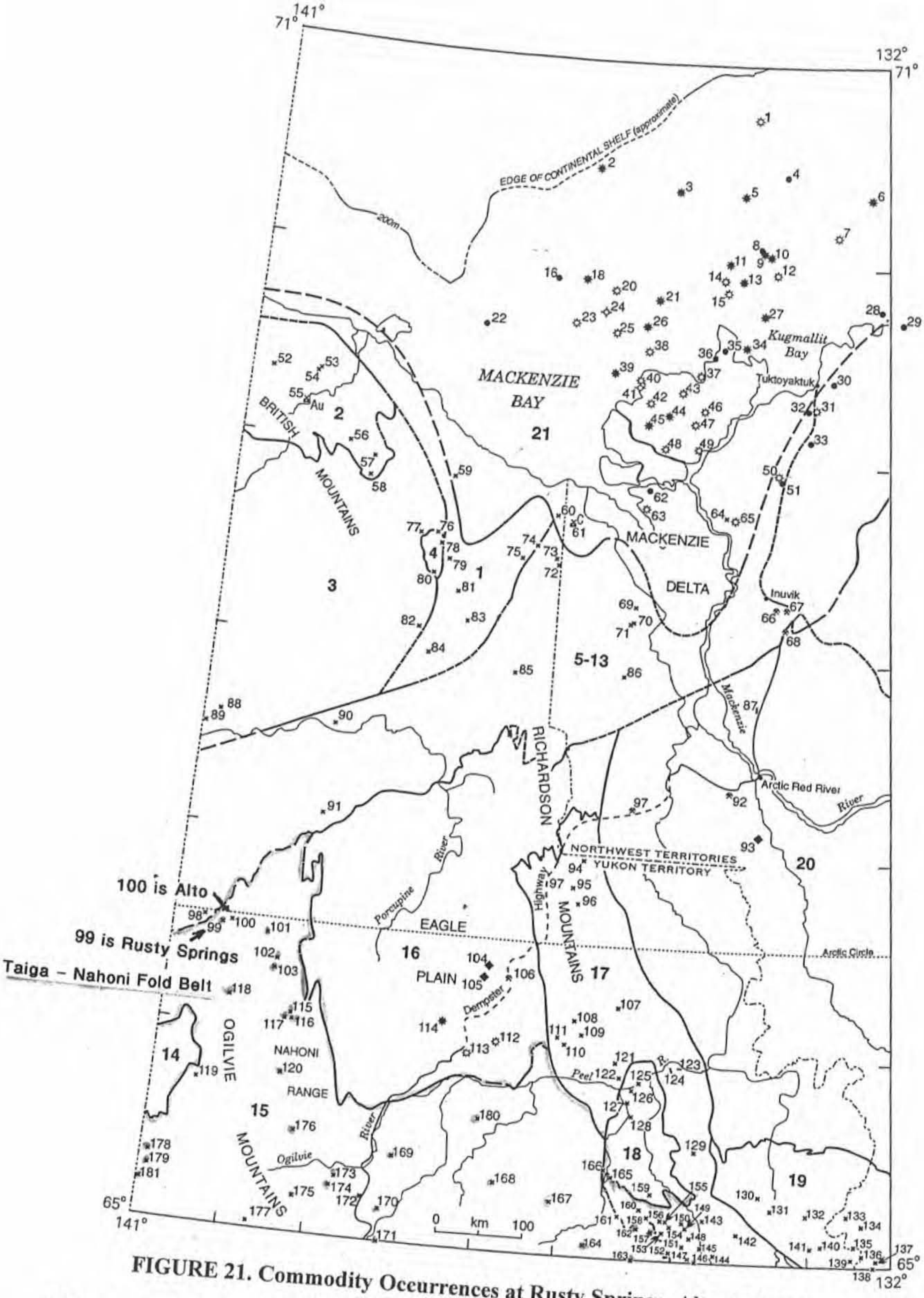


FIGURE 21. Commodity Occurrences at Rusty Springs, Alto, and Environs. from Norris and Hughes, 1996.

Note on the following two pages of tables that most of the Pb, Zn, Ag, Cu, Ba occurrences are in the Taiga-Nahoni Fold Belt.

Commodity occurrences grouped by NTS area, with tectonic setting, status and key reference

NTS area/ Commodity no.	Tectonic element	Commodity	Status*	Reference	Locality no.
		Metallic Minerals and Gypsum			
106 E1/1	Richardson Anticlinorium	Cu	7	Norris, 1982a	145
106 E1/2	Richardson Anticlinorium	U	7	DIAND, 1993	147
106 E1/3	Richardson Anticlinorium	U	7	DIAND, 1993	144
106 E1/4	Richardson Anticlinorium	U	7	DIAND, 1993	148
106 E1/5	Richardson Anticlinorium	U	7	DIAND, 1993	150
106 E1/6	Richardson Anticlinorium	U	7	DIAND, 1993	149
106 E1/7	Richardson Anticlinorium	Zn, Pb	7	DIAND, 1993	143
106 E1/8	Richardson Anticlinorium	Cu	7	DIAND, 1993	151
106 E1/9	Richardson Anticlinorium	U, Cu	7	DIAND, 1993	146
106 E2/1	Taiga-Nahoni Foldbelt	Zn, Pb	7	Dawson, 1975	157
106 E2/3	Richardson Anticlinorium	Cu, U	7	DIAND, 1993	152
106 E2/4	Richardson Anticlinorium	Cu	7	DIAND, 1993	154
106 E2/5	Richardson Anticlinorium	Zn	7	DIAND, 1993	155
106 E2/6	Richardson Anticlinorium	U	7	DIAND, 1993	156
106 E2/7	Richardson Anticlinorium	U	7	DIAND, 1993	153
106 E3/1	Taiga-Nahoni Foldbelt	Pb, Zn	7	Dawson, 1975	162
106 E3/2	Taiga-Nahoni Foldbelt	Pb, Zn	7	DIAND, 1993	163
106 E4/1	Taiga-Nahoni Foldbelt	Pb, Zn	7	DIAND, 1993	164
106 E9/1	Richardson Anticlinorium	Zn, Pb	7	DIAND, 1993	129
106 E14/3	Richardson Anticlinorium	Pb, Zn	7	DIAND, 1993	121
106 E14/4	Richardson Anticlinorium	Zn	7	DIAND, 1993	122
106 F1/1	Mackenzie Foldbelt	Fe	2	Crest Explorations Ltd., unpub. rep., 1963	133
106 F1/2	Mackenzie Foldbelt	Fe	2	Crest Explorations Ltd., unpub. rep., 1963	134
106 F1/3	Mackenzie Foldbelt	Ba	7	Norris, 1982b	136
106 F1/4	Mackenzie Foldbelt	Zn, Pb	7	Dawson, 1975	137
106 F1/5	Mackenzie Foldbelt	Zn	7	DIAND, 1993	138
106 F1/6	Mackenzie Foldbelt	Zn	7	DIAND, 1993	139
106 F1/7	Mackenzie Foldbelt	Zn	7	DIAND, 1993	135
106 F2/1	Mackenzie Foldbelt	Zn	7	DIAND, 1993	141
106 F2/2	Mackenzie Foldbelt	Zn	7	DIAND, 1993	140
106 F2/3	Mackenzie Foldbelt	Fe	7	DIAND, 1993	132
106 F4/1	Richardson Anticlinorium	Zn	7	DIAND, 1993	142
106 F5/1	Mackenzie Foldbelt	gp	7	Norris, 1982b	130
106 F5/2	Mackenzie Foldbelt	Zn	7	DIAND, 1993	131
106 L3/1	Richardson Anticlinorium	Fe, U, Cu	7	EMR, 1980a	107
106 L4/1	Richardson Anticlinorium	Pb, Zn	7	DIAND, 1993	108
106 L4/2	Richardson Anticlinorium	Pb, Zn	7	DIAND, 1993	109
106 L13/1	Richardson Anticlinorium	gp	7	Norris, 1981a	94
106 L13/2	Richardson Anticlinorium	Pb, Zn	7	DIAND, 1993	96
106 M13/1	Aklavik Arch Complex	Cu	7	EMR, 1980a	86
107 B4/1	Aklavik Arch Complex	gp	7	Norris, 1981b	71
107 B5/1	Aklavik Arch Complex	gp	7	Norris, 1981b	69
116 F2/1	Taiga-Nahoni Foldbelt	Zn, Pb	7	Norris, 1982c	179
116 F2/2	Taiga-Nahoni Foldbelt	Zn	7	DIAND, 1993	181
116 F7/1	Taiga-Nahoni Foldbelt	Zn, Pb, U	7	DIAND, 1993	178
116 G1/1	Taiga-Nahoni Foldbelt	Cu, Co	7	DIAND, 1993	171
116 G1/2	Taiga-Nahoni Foldbelt	Ba	7	DIAND, 1993	170
116 G1/3	Taiga-Nahoni Foldbelt	Ba	7	DIAND, 1993	172
116 G3/1	Taiga-Nahoni Foldbelt	Pb, Zn, Ag	7	Norris, 1982c	175
116 G4/1	Taiga-Nahoni Foldbelt	P	7	Norris, 1982c	177
116 G7/1	Taiga-Nahoni Foldbelt	Pb, Zn	7	DIAND, 1993	173
116 G7/2	Taiga-Nahoni Foldbelt	Ba, Pb	7	DIAND, 1993	174
116 G8/1	Taiga-Nahoni Foldbelt	Ba	7	DIAND, 1993	169
116 G11/1	Taiga-Nahoni Foldbelt	Pb	7	DIAND, 1993	176
116 G14/1	Taiga-Nahoni Foldbelt	Pb	7	DIAND, 1993	120
116 H7/1	Taiga-Nahoni Foldbelt	Pb, Zn, Cu	7	EMR, 1980a	168
116 H8/1	Taiga-Nahoni Foldbelt	Ba	7	DIAND, 1993	167
116 H10/1	Taiga-Nahoni Foldbelt	Pb, Zn	7	Norris, 1982d	180
116 I1/1	Richardson Anticlinorium	Zn, Pb	7	Norris, 1981c	111
116 I1/2	Richardson Anticlinorium	Zn, Pb	7	Norris, 1981c	110
116 I16/1	Richardson Anticlinorium	Zn	7	DIAND, 1993	95
116 J3/1	Taiga-Nahoni Foldbelt	Pb, Zn	7	DIAND, 1993	117
116 J3/2	Taiga-Nahoni Foldbelt	Pb, Zn	7	DIAND, 1993	116
116 J3/3	Taiga-Nahoni Foldbelt	Pb, Zn	7	DIAND, 1993	115
116 J5/1	Taiga-Nahoni Foldbelt	Pb, Zn	7	EMR, 1980a	102
116 J5/2	Taiga-Nahoni Foldbelt	Pb, Zn	7	EMR, 1980a	103
116 J5/3	Taiga-Nahoni Foldbelt	Pb, Zn	7	DIAND, 1993	101
116 K1/1	Taiga-Nahoni Foldbelt	Cu, Zn	7	DIAND, 1993	118
116 K9/1	Taiga-Nahoni Foldbelt	Fe	7	Norris, 1976	100
116 K9/2	Taiga-Nahoni Foldbelt	Ag, Zn, Cu	7	Rio Alto, 1976	99
116 K10/1	Aklavik Arch Complex	Fe, Zn	7	Norris, 1979	98
116 N10/1	Old Crow-Babbage Depression	W	7	EMR, 1980a	88
116 N10/2	Old Crow-Babbage Depression	Pb, Zn	7	DIAND, 1993	89

from Norris and Hughes, 1996.

NTS area/ Commodity no.	Tectonic element	Commodity	Status*	Reference	Locality no.
116 03/1	Aklavik Arch Complex	Zn	7	DIAND, 1993	91
116 O11/1	Aklavik Arch Complex	F, U	7	DIAND, 1993	90
116 O16/1	Rapid Depression	Sr, P, U, Cu	7	EMR, 1980a	84
117 A2/1	Rapid Depression	U	7	EMR, 1980a	83
117 A6/1	Barn Uplift	U	7	DIAND, 1993	80
117 A7/1	Rapid Depression	U, Mo, W	7	EMR, 1980a	79
117 A8/1	Rapid Depression	Fe, P	7	Norris, 1981d	75
117 A8/2	Aklavik Arch Complex	Fe, P	7	Norris, 1981d	72
117 A8/3	Aklavik Arch Complex	Fe, P	7	DIAND, 1993	73
117 A9/1	Rapid Depression	Fe, P	7	Sturman and Mandarino, 1975	74
117 A11/1	Old Crow-Babbage Depression	Cu, U, Mo, W	7	EMR, 1980a	76
117 A11/2	Barn Uplift	W, Mo	7	Norris, 1981d	78
117 A13/1	Romanzof Uplift	W, Cu, Mo	7	DIAND, 1993	58
117 A13/2	Romanzof Uplift	Au	7	Norris, 1981d	57
117 C1/1	Romanzof Uplift	Au	7	EMR, 1980b	55
		Industrial Minerals			
106 M3/1	Northern Interior Platform	gvl	7	Duk-Rodkin and Hughes, 1992	97
106 M8/1	Northern Interior Platform	gvl	7	Harris et al., 1983	92
116 I7/1	Eagle Fold Belt	ss	7	Norris, 1981c	106
107 B2/1	Aklavik Arch Complex	ls	7	Norris, 1981b	68
107 B7/1	Aklavik Arch Complex	ls	7	Norris, 1981b	67
107 B7/2	Aklavik Arch Complex	dol	7	Norris, 1981b	66
		Coal			
106 E2/2	Richardson Anticlinorium	C	2	DIAND, 1993	158
106 E3/3	Taiga-Nahoni Foldbelt	C	2	DIAND, 1993	161
106 E6/1	Bonnet Plume Basin	C	2	Norris and Hopkins, 1977	166
106 E6/2	Bonnet Plume Basin	C	2	Norris and Hopkins, 1977	165
106 E6/3	Richardson Anticlinorium	C	2	Norris and Hopkins, 1977	160
106 E7/1	Bonnet Plume Basin	C	2	DIAND, 1993	159
106 E11/1	Bonnet Plume Basin	C	2	DIAND, 1993	128
106 E14/1	Bonnet Plume Basin	C	2	Norris and Hopkins, 1977	125
106 E14/2	Bonnet Plume Basin	C	2	Norris and Hopkins, 1977	126
106 E14/5	Bonnet Plume Basin	C	2	DIAND, 1993	127
107 B4/2	Aklavik Arch Complex	C	7	Norris, 1981b	70
107 B11/1	Aklavik Arch Complex	C	7	Price et al., 1980	64
116 F5/1	Taiga-Nahoni Foldbelt	C	7	Norris, 1976	119
116 P15/1	Aklavik Arch Complex	C	7	Norris, 1974	85
117 A3/1	Old Crow-Babbage Depression	C	7	Norris, 1981d	82
117 A7/2	Rapid Depression	C	7	Cameron et al., 1986	81
117 A9/2	Aklavik Arch Complex	C	7	DIAND, 1993	61
117 A9/3	Rapid Depression	C	7	DIAND, 1993	60
117 A11/3	Old Crow-Babbage Depression	C	7	Norris, 1981d	77
117 A14/1	Rapid Depression	C	7	Norris, 1981d	59
117 C8/1	Romanzof Uplift	C	7	Cameron et al., 1986	53
117 C8/2	Romanzof Uplift	C	7	Cameron et al., 1986	54
117 C8/3	Romanzof Uplift	C	7	Cameron et al., 1986	52
117 D4/1	Romanzof Uplift	C	7	Cameron et al., 1986	56
		Bitumen Intrusions			
106 E15/1	Richardson Anticlinorium	B	7	Stelck, 1944	123
106 E15/2	Richardson Anticlinorium	B	7	Stelck, 1944	124
106 N13/1	Northern Interior Platform	B	7	Norris and Cameron, 1986	87
		Oil and Gas Seeps			
106 N4/1	Northern Interior Platform	G	7	Norris, 1981e	93
116 I6/1	Eagle Fold Belt	O	7	Norris, 1974	104
116 I6/2	Eagle Fold Belt	O	7	Norris, 1974	105

from Norris and Hughes, 1996.

sulphur-poor fluid that encounters an oxidized fluid such as groundwater.

Both supergene and hypogene concentration of nonsulphide zinc require a source, fluid transport, and a site of deposition. Hence, zinc concentration is similar in these three fundamental requirements to oil and gas concentrations. The comparison of process for nonsulphide zinc and hydrocarbon concentrations is made most apparent at Rusty Springs by the coexistence of metalliferous minerals and bitumen in the Katshat horizon and in dolostone.

Norris and Hughes (1996) list 17 zinc occurrences within the Taiga – Nahoni Foldbelt (Figure 21). These occurrences are reportedly within limestone that ranges in age from Cambrian to Devonian, suggesting that the zinc occurrences are epigenetic, that is superimposed upon and concentrated where physical and chemical nature of host rocks favoured deposition from transporting fluids. Black shale of Lower Devonian Road River Formation, that underlies limestone of Devonian Ogilvie Formation footwall to Rusty Springs, has base metal occurrences in the Hart River area (Norris and Hughes, 1996, Abbott, 1997. Both shale of Road River Formation and the Upper Devonian – Lower Carboniferous Ford lake Shale Formation have been cited as sources for the hydrocarbon concentrations of Eagle Plain Basin immediately east of the Taiga – Nahoni Fold Belt. Therefore there is some general evidence of coincident source and transport of metals and hydrocarbons.

Besides coincident source and transport of metals and hydrocarbons, there are chemical and physical traps as evidenced by the Katshat horizon at Rusty Springs, in my interpretation, a significant metal and modest hydrocarbon concentration in neutralizing brecciated and karsted dolostone along a thrust surface capped by cap "chert".

The Prospective Large-Scale Regional Setting

Lower Paleozoic stratigraphy in northern Yukon has been described anew by Morrow (1999). In the Porcupine River area, east of Rusty Springs, the interface between the Taiga – Nahoni Fold Belt and the Eagle Fold Belt, Morrow has interpreted the section from Ordovician-Silurian Road River Formation upward through Upper and Middle Devonian Canol Formation as Michelle Formation, an argillaceous and shaly limestone with abundant and diverse fossils, sedimentary features indicative of deposition on a submarine slope, and clearly distinct from the clean shallow water limestone of Ogilvie Formation, in turn overlain by rusty weathering silicic black shale of Canol Formation. He remarks on the variable thickness of formations and the lack of good exposure of contacts between formations. We have found over the past several years that this is an indication of layer parallel thrusting, that cuts out or stacks section, makes traps for metal concentration and subsequently dismembers them.

Osadetz et al (p. 10, 2005) state as follows:

"The Laramide structures developed after deposition of the youngest preserved strata in the Cretaceous succession. The bedrock structures of this deformation are very well described where Cretaceous strata are preserved. However, there are regions where Cretaceous strata are not preserved and the recognition of structures of earlier events will be difficult to identify and separate from the Laramide deformational geometry. In addition, there are clearly multiple important detachments in the Laramide deformation. The relationship between the deformation in the Proterozoic, Paleozoic and Cretaceous is complicated by the presence of these major detachment surfaces."

Specific Guides to Exploration

The above characteristics of, and controls to, metal concentration translate into the following guides to exploration:

1. Occurrences are commonly in dolostone, and black mudstone. The dolostone is generally footwall to black mudstone that in turn is overlain by 'chert'. The dolostone is a district-scale hydrothermal alteration of a regional-scale limestone, and the largest footprint of the area of interest. There are in some districts manganese-rich shales, and concordant silicic magnetite bodies.

2. Limonitic gossans are the most obvious evidence of vertical displacement of water table. Limonite and hematite on faults and fracture signify fluid flow in hypogene occurrences and, both vertical and lateral displacement of water table and metallic elements in supergene occurrences. Note that where there is abundant pyrite, there is a lot of acid generation and the gossan is vuggy and totally leached of zinc.

3. Fluid movement through porosity and permeability is expressed as solution cavities in limestone (karsting), faulting and fracturing, and dissolution of a carbonate cement in clastic rocks. Hydraulic breccias along faults suggest that fluid flow was focused along faults and had phases of over pressure as at the Padaeng deposit, Thailand (Reynolds et al, 2003)

4. A neutralizing chemical trap and a physical trap can generally be poached from the oil and gas explorationists who have been through the Rusty Springs area and have published their results. Evidence of a chemical trap is generally bitumen, iron oxide minerals, and of course metallic minerals, in cavities and on fractures. At outcrop-scale the physical traps are faults and unconformities, solution cavities in carbonate rocks and cavities left from dissolution of cement in clastic rocks.

5. Some of the most significant hypogene nonsulphide zinc deposits are on bedding-parallel faults along which the latest movement has been in a reverse sense. The Vazante deposit in Brazil is an example (Hitzman et al, 2003).

6. In many instances these fault surfaces have a dolomitic footwall that is the regional footprint of an area of interest within an otherwise limestone terrain. Bitumen, breccia, and karst coincide with dolomite but are not common in the peripheral limestone. The hanging wall is a black 'chert', in some instances interpreted as a primary rock type, in other instances as a product of silicification, or as an aspect of extreme cataclasis along faults, ie: a psudotachylite.

A Proposed Exploration Program

The hypothetical nonsulphide zinc target in the region of Rusty Springs could be approached as follows:

Three weeks compilation of regional geology, known occurrences, and government stream sediment sampling within the Taiga- Nahoni Fold Belt. One geologist, 21 days @$450/day, $9,450 + $150.00 photocopying	9,600.
Three weeks of helicopter-supported traversing with three hours of helicopter time per day, 21 days X 3 hours/day @ $1500/ hour	94,500.
Placement of fuel caches	10,000
Three weeks of traversing by two geologists, 21 days, 2 @$450/day	18,900
Three weeks sustenance in field for two geologists and helicopter pilot 21 days, 3 X $75.00/day	4,725
Expendables, base maps, assays, sample bags, other field supplies	1,000.
Mobilization and contingency	11,275.
Total	150,000

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APPENDIX A

Summary of Some Carbonate-Hosted Pb-Zn-Ag Concentrations in North America's Cordillera with Possible Hypogene Nonsulphide Mineral Assemblages: Characteristics, Proposed Genesis, and Relevance to Rusty Springs

General Statement

Traditionally, carbonate-hosted Pb-Zn-Ag concentrations in North America are described as hypogene sulphide open space fillings in and replacements of limestone. Nonsulphide metallic mineral species, or low-sulphur metallic mineral species, in these occurrences are invariably interpreted as supergene, that is, derived by oxidation of hypogene sulphide mineral assemblages. None to my knowledge have been considered in light of recent suggestions that some nonsulphide deposits may be, in whole or in part, primary and hypogene (Sangster, D.F., 2003). It is an interesting and worthwhile exercise to consider Rusty Springs as in large part a nonsulphide zinc occurrence of hypogene origin and, to compare it to other similar occurrences described in the literature from North America's Cordillera.

For purposes of clarity, and for comparing deposits, one should recognize that there are, in my opinion, three subtypes of carbonate-hosted Pb-Zn-Ag deposits in North America and, world-wide. There are undoubtedly intermediates to these subtypes but to make the point for a Cordilleran subtype, hosted by organic-rich mudstone and with a hangingwall chert and a footwall dolostone, let us stay with these three end members:

1. Mississippi-Valley Type deposits are the most thoroughly documented. They are stratabound massive sulphide occupying karst cavities and replacing, reefal Cambrian and Lower Paleozoic limestone and dolostone of intracratonic basins floored with crystalline Precambrian basement. The prime examples are in southeast Missouri, U.S.A.(Leach and Sangster, 1993). Although metal ratios are variable, zinc is the dominant metal and silver is essentially nil. They are deposited from low temperature (50 to 150 degrees C) oxidized basinal brines.

2. Discordant mantos, chimneys, and veins of massive to near massive Pb-Zn (Ag, Cu, Au) sulphide with contact skarns occur in Mesozoic limestone and dolostone. They are commonly associated with intrusions. Lead is the dominant mineral. Best described examples are in northern Chihuahua, Mexico (Megaw et al, 1996). These have been called the "high-temperature –type" because their ore fluids were at >250 degrees C, oxidized, and either of magmatic origin or a mix of magmatic and sedimentary derived hydrothermal fluids. The host carbonate successions overlap two continental tectonostratigraphic terranes and are overlain by Tertiary volcanic rocks.

3. Cordilleran-type deposits. These are generally lumped in with Mississippi Valley-type deposits as they occur within Paleozoic carbonate successions and are precipitated from

basinal brines of low temperature. However, their massive and near massive sulphide is mostly within organic carbon-rich mudstone with a hanging wall chert and basal dolostone. Zinc is the dominant metal. Silver content is extremely variable. They are on the slope to basin continental side of marginal basins that have become fold and thrust belts where allochthonous terranes impact the continental margin. They are not associated with igneous activity and are attributed to precipitation from low-temperature basinal brines. The best documented examples are Red Dog in Alaska, Howard's Pass in Yukon. Nonsulphide zinc is rare at Red Dog, a curiosity at Howard's Pass, but substantial at occurrences farther south as at Pioche, Nevada. In each instance the published descriptions attribute the nonsulphide zinc to supergene processes. I contend that Rusty Springs, Yukon belongs to this subtype and that its nonsulphide, and low sulphur mineral assemblage may be hypogene.

Deposition of Cordilleran-type deposits appears to be essentially continuous from late syngenetic, diagenetic, and deformation-induced epigenetic. However, most field relationships, isotopic age determinations, and paleomagnetic studies suggest metallic mineral emplacement is slightly younger than its host rocks.

Common Characteristics and a Suggested Genesis

All of the carbonate-hosted Pb-Zn-Ag deposits and occurrences in the North American Cordillera, whether sulphide, nonsulphide, or a mix thereof, have the following in common:

1. They are stratabound within Paleozoic limestone, and dolostone successions. These successions invariably include, i) black mudstone rich in organic carbon and, ii) black silicic rock. The former is generally called black shale. It hosts most of the ore bodies. It does not necessarily record anoxia and indeed, the complete succession reflects oxidized bottom waters. The latter are generally called "chert" and are commonly hanging wall to, or surround, ore bodies. At Red Dog, Alaska, these silicic rocks tend to be Al-bearing biogenic silica. It was probably opal at time of deposition and is now fine-grained microcrystalline quartz. Some of this silica may have been deposited during sedimentation, but probably much was remobilized during diagenesis and replaces limestone.

2. The base to the Paleozoic carbonate-mudstone-silicic rock succession is generally Cambrian-Precambrian siliciclastic sedimentary rock. This base to section is an aquifer. It is generally oxidized, slightly metasomatized and contains secondary K feldspar and white mica. It is also slightly mineralized.

3. These sedimentary rocks and that envelop deposits are at the inboard edge of a continental marginal basin and broad regional uplifts. The outboard edge is a volcanic arc.

4. The marginal basin has been compressed into a fold and thrust belt, generally with regional-scale detachment faults. There is generally a later extensional. Deformation

accounts for the widely varying thicknesses of type stratigraphic sections. In some instances the organic-rich mudstone has acted as shear planes in major parallel shortening during thrusting. Pseudotachylite has been described on thrust planes.

5. There are only a few post-ore igneous rocks in the vicinity. Skarns about these igneous rocks are attributed to modification of previously emplaced sulphide assemblages.

6. The proportions of zinc, lead, and silver vary greatly. Copper can be significant but is generally minor and gold is insignificant. Sphalerite is a low-Fe variety and iron sulphide mineral species (pyrite, pyrrhotite), although invariably present, are generally less abundant than the base metal sulphide minerals. Some occurrences have barite, some have fluorite.

7. Silicification and dolomitization is peripheral to deposits. It is common to have drops of hydrocarbon in open spaces within the secondary dolostone.

8. Although host rocks are Paleozoic on the basis of fossil assemblages, the age of the ore mineral assemblage is generally considered to be slightly younger on the basis of field relationships, isotopic age determinations, and paleomagnetic studies.

For example, at Red Dog where host rock is Mississippian (360 to 320 Ma.), a Re-Os radiometric age on pyrite within massive sphalerite and galena is 338 Ma. The sulphide assemblage is interpreted as subseafloor syngenetic and diagenetic, subsequently modified by major orogeny.

9. The Cordilleran-type includes both supergene and hypogene nosulphide deposits. Most known nonsulphide deposits are predominately zinc with lesser lead and silver. They are stratabound but may be discordant and structurally controlled. They are bodies of willemite, franklinite, zincite with variable amounts of sphalerite, hematite, and galena. They are associated with strataform iron and manganese-rich horizons. They have formed by mixing of a reduced, low to moderate-temperature (80-200 degree C), zinc-rich, sulphur poor oxidized fluid.

10. There is general consensus that basinal brines have been the transport agent for lead and zinc in the formation of both Mississippi Valley and Cordilleran carbonate-hosted deposits. The uptake of metals into these brines from rocks deep in the succession is a combination of sulphide mineral hydrolysis and chloride complexing. Metal-rich basinal fluids most likely form as a result of diagenetic destruction of metal-bearing solid phases in the presence of aqueous fluids of very high salinity and low H_2S (Hanor, 1996). It has been proposed that high salinity comes from fluid circulation through evaporates within carbonate rocks of the enveloping stratigraphic section.

Deposition of sulphide minerals, low sulphur species metallic minerals and nonsulphide metallic minerals occurs within a reductant, the carbon-rich mudstone or limestone, such as the Kuna Formation at Red Dog and the Katshat horizon at Rusty Springs. This reductant is iron-poor and sulphur poor. Paucity of iron results from an almost nil clastic component. Paucity of sulphur results from thermal maturation of abundant organic carbon during diagenesis, mineralization, and lithification . This releases methane and hydrogen sulphide that cause full or part reduction of the oxidized metalliferous fluid and deposition of sulphide, low-sulphur, and nonsulphide metallic minerals in a variety of abundances dependant on local conditions.. Expulsion of methane, hydrogen sulphide, and water contributes to elevated fluid pressures and hydrofracturing, eliminating the need for a feeder.

It is also suggested herein that reduction as described above is not restricted to the organic carbon-rich mudstone and limestone. It may account for the presence of magnetite after hematite peripheral to base metal concentrations, as observed in the Alto ironstone.

Selected Deposits and Districts in the North American Cordillera that May Have Characteristics and Genesis in Common with Rusty Springs.

Pioche District, Nevada

Robert Termuede has suggested that the metal concentrations in the Pioche District, Lincoln County, Nevada are an interesting analogue to Rusty Springs. Pioche has a long history beginning in 1869. It is most comprehensively described in USGS Professional Paper 171 (Westgate and Knopf, 1932), and Gemmill, 1968).

The Pioche District produced more than 6 million tons of primary pyrite, argentiferous galena, and sphalerite between the 1920's and mid-1960's (Gemmill, 1968). This had a gross value of more than $100 million. The deposits have been described as fracture-controlled, mantos (Park and MacDiarmid, 1964) or MVT-type occurrences (James and Knight, 1979) stratabound within the carbon-rich Cambrian Combined Metals Limestone Member of the Pioche Shale Formation (Figure A1). The Combined Metals Member is 50 feet thick. The ore mineral assemblage occurs along fractures up to 300 m wide and 3 km long. Edges of orebodies are in manganosiderite.

Although not generally recorded, there was also $21 million of direct-shipping oxide, "silver-chloride" ores mined prior to 1900 from fractures in Cambrian Prospect Mountain Quartzite Formation that is stratigraphically lower than the Combined Metals Limestone Formation (McNight, 1933).. There has also been production of nonsulphide "replacement" bodies from the Highland Peak Formation, a dominately carbonate section, above the Pioche Shale Formation (Figure A1). Ore bodies are generally associated with peripheral manganiferous siderite.

Ore bodies are broken by faults, originally interpreted as thrusts, but later as Basin and Range-type Tertiary normal faults. There are accounts of a "soft carbonaceous clay layer above the ore bed, or, at places, laterally….." (Gemmel. 1968, p.1143). This carbonaceous "ore blanket" is underlain by "siliceous footwall shale" that is described by Gemmell as follows: "This siliceous member resembles a brittle pane of glass that has

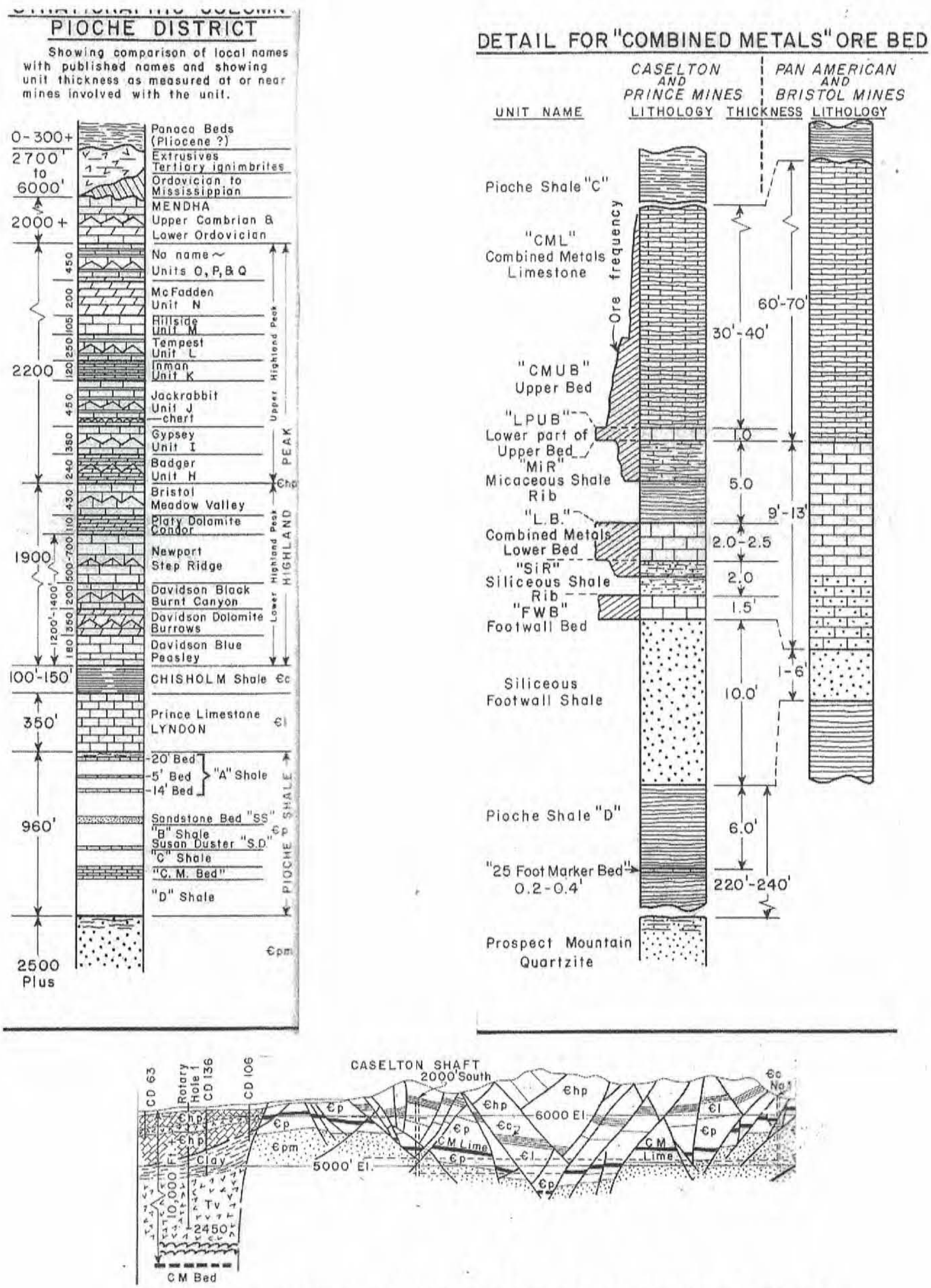

FIGURE A1. Stratigraphy of the Pioche District Nevada and Cross-Section Looking Northwest through the Caselton Shaft. From Gemmell, 1968

been cracked by crustal movement" (p. 1144). It sounds very much like pseudotachylite along a thrust surface. I think this is comparable to the Katshat Horizon at Rusty Springs.

Oxide ores extend below the present water table, are described as porous beds of banded black mud with 6 to 8 ounces of silver per ton, six to eight per cent lead as lead carbonate with jarosite, limonite, and nil to 10 to 12 per cent zinc

Park City, Utah

There has been continuous mining at Park City, in Utah's Wasatch fold and thrust belt since 1869 (Barnes and Simos, 1968). Approximately 15 million tons were produced through the 1960's from individual veins and stratiform bodies containing 0.02 oz gold, five to 50 oz of silver, nil to 14 percent lead, nil to10 percent zinc, and nil to 0.5 percent copper. The mineral assemblage is argentiferous galena, and sphalerite. Ore bodies are within a district three by five miles and through a vertical extent of several thousand feet.

Host rocks are Mississippian limestones, Pennsylvanian quartzite, and Permian interbedded black shaly and cherty limestone (Figure A3). The Paleozoic section is overlain by Triassic shale and sandstone that varies from red to green in colour. There are early to mid-Jurassic intrusions of diorite within the district. Mineralizing fluids are attributed to these intrusions.

Replacement deposits are generally in one horizon of cherty limestone, 20 feet thick, within the Pennsylvanian/Permian Lower Park City Formation and throughout the entire 350 foot thickness of the Mississippian Humbug Formation (Figure A4). In some instances ore bodies are confined to the thrust zone between Park City Formation and its underlying Webber Quartzite Formation. Ore is considerably oxidized.

The Metaline District, Washington

Between 1906 and 1965 the Metaline District produced 16 million tons of ore containing 400,000 tons of zinc and 178,000 tons of lead from ore bodies within carbonaceous and silicic breccia. This is within the Josephine Horizon of Cambrian Metaline Formation, of dominantly limestone and dolostone (McConnel and Anderson, 1968) (Figure A5).

Typically, the Josephine Horizon is an irregularly brecciated layer from a few feet to 200 feet thick and with a strike length of more than two miles. Fragments and blocks in the breccia are one inch to 10 feet on a side and consist of variable amounts of gray fine-grained laminated dolostone, light gray coarse-grained massive dolostone, "zebra rock" (coarse crystalline dolomite with alternating light and dark gray bands), lithographic limestone, and black jasperoid. Matrix of this breccia is dense, fine-grained, carbon-rich dolostone, and black jasperoid, with dispersed sphalerite and galena. Sphalerite and galena also occur on thin silicic laminae in dolostone. There are also lenses of quartzite up to eight feet thick, 10 to 15 feet wide, and 200 feet long.

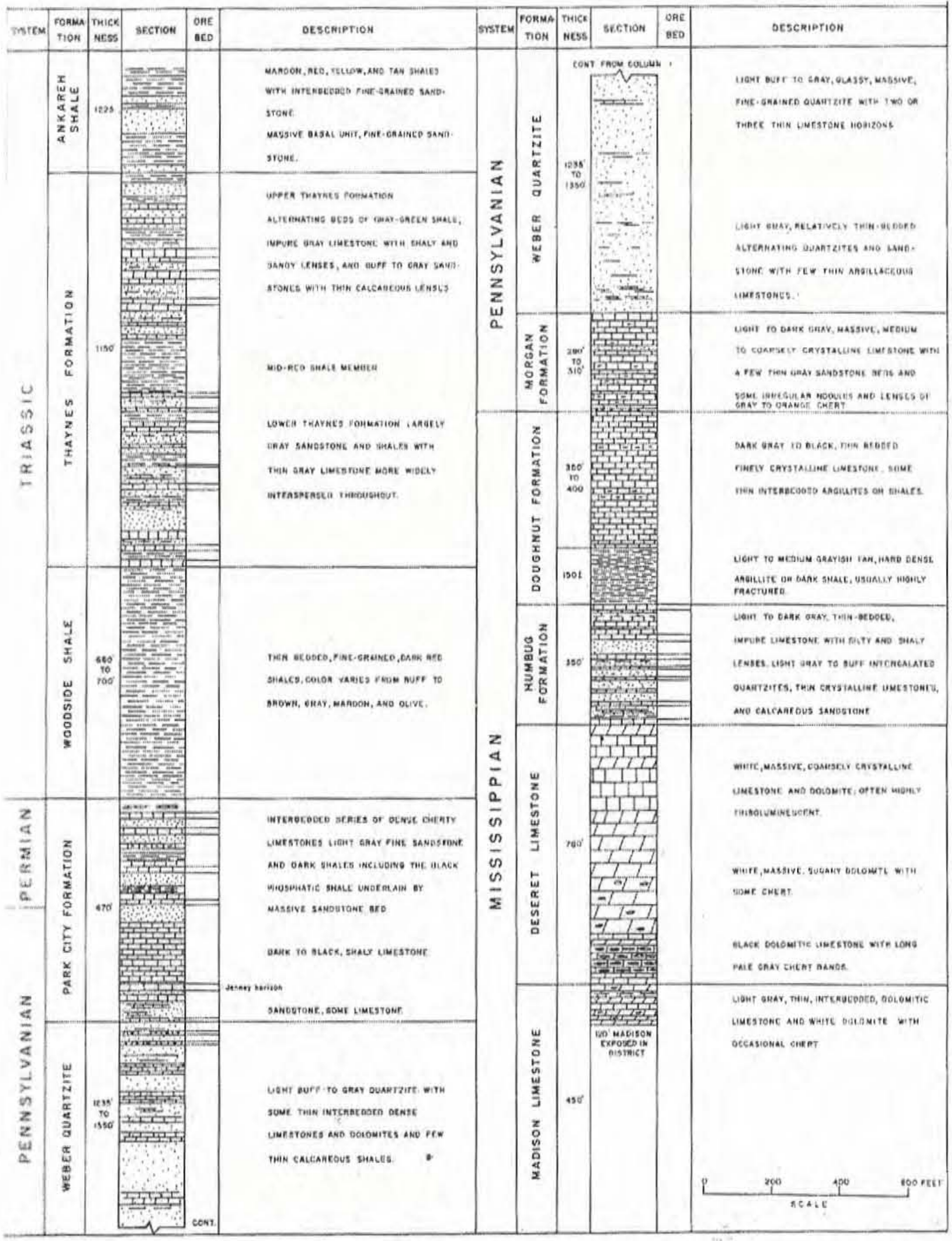

Figure A3. Stratigraphic Section, Park City District, Utah. From Barnes and Simos, 1968

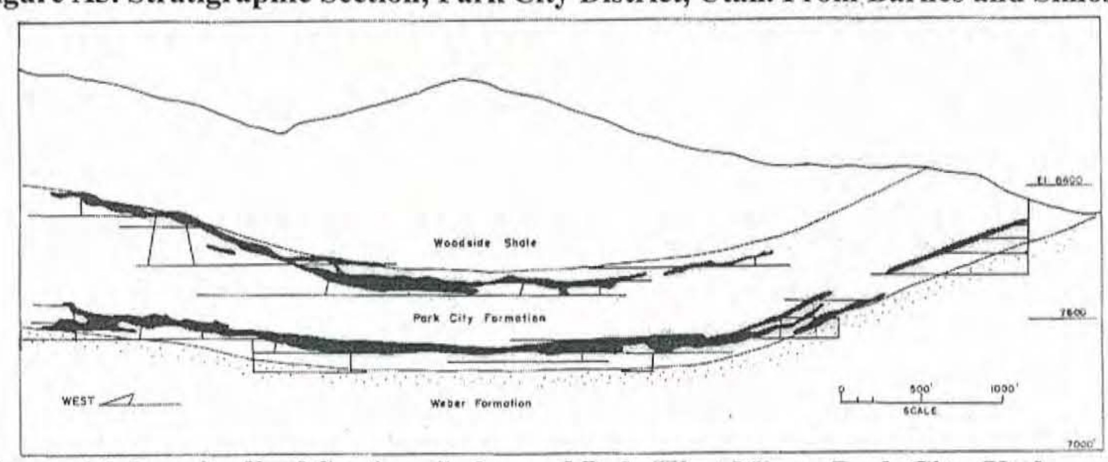

Figure A4. Longitudinal Section, Judge and Daly West Mines, Park City, Utah From Barnes and Simos, 1968

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The Metaline Limestone Josephine Horizon is overlain by the Ledbetter Slate Formation , an Ordovician black, carbonaceous argillite and slate, and underlain by a succession of Cambrian limestone, dolostone, phyllite, and quartzite members of the Metaline Limestone Formation that bottom in a conglomerate resting upon PreCambrian schistose greenstone. The Metaline Limestone Formation is extremely variable in thickness. The section is intruded by the Cretaceous (?) Kaniksu batholith that varies in composition from quartz monzonite to granodiorite. It outcrops within two miles of the mines.

The Metaline District consists of four blocks bound by northeasterly faults, each containing northeast-trending anticlines with steep northwest-dipping limbs and gentle southeast-dipping limbs and, northwest-striking thrust faults.

Bodies of sphalerite, galena, and pyrite although stratabound within the Josephine Horizon, are irregular in shape and in size from pods and lenses a few feet thick and wide to masses 3000 feet long and 100 feet thick. They dip 10 to 30^0 along limbs and crest of anticlines (Figure A6). The ratio of zinc to lead in mined ore is 2.25 to 1. The non-sulphide minerals are gray jasperoid, crystalline quartz, calcite, dolomite, paligorskite (hydrous magnesium-aluminum silicate aka mountain leather), barite, and graphite. There is no mention in the literature of nonsulphide zinc or lead minerals and no silver enrichment.

The nearby Kaniksu batholith is unmineralized and there is almost no typical contact metamorphic effects preceeding mineralization in any of the principal mines.

Van Stone Mine Area, Stevens County, Washington

The original discovery was along a tributary of the Columbia River prior to World War 1. Production through 1965 was 2.2 million tons or ore containing 120,000 tons of zinc concentrate with 54 per cent zinc, and 10,700 tons of lead concentrate with 62 percent lead. Concentrate had no significant silver.

The area is part of the Kootenay Arc / Selkirk Zinc – Lead Belt that extends from Revelstoke, B.C. to Metaline Falls (Cox, 1968). This is a belt of complex folding, high-angle normal faults and extensive thrust faults. Ore bodies are in the Ordovician/Silurian Leadbetter Slate Formation that is hangingwall to deposits of the Metaline District, and in the Metaline Formation that hosts deposits of the Metaline District, plus successively stratigraphically deeper Maitlen Phyllite Formation and Monk Dolomite Formation (Figure A7).

Ore bodies of sphalerite and galena are conformable within dolostone flanked by limestone. Accessory minerals, attributed to alteration about the Kaniksu batholith are tremolite, jasperoid, brucite, calcite, palagorskite, pyrite and pyrrhotite. There are extensive areas of deep oxidation, all attributed to weathering along fractures. There is no note of production from this nonsulphide mineral assemblage.

Tertiary
- Olivine Trachybasalt
- Tiger Formation
  - Terrestrial sandstone, conglomerate, and clay.
  - Unconformity

Cretaceous
- Kaniksu batholith and associated pegmatite and lamprophyre dikes
  - Gap in record

Silurian and Devonian — 2000 ft.
- Black argillite and slate with beds of limestone and lenses of conglomerate, sandstone, quartzite, sandy limestone and sandy dolomite

Ordovician
- Ledbetter Slate — 2200 to 2500 ft.
  - Black carbonaceous argillite and slate; contains some black limestone and limy argillite and local beds of black chert and gray quartzite and gray crystalline dolomite

Cambrian
- Metaline Limestone — 4500 to 6500 ft.
  - Josephine Unit — 0 to 200 ft.
    - Mixture of fine grained black dolomite, black jasperoid, fine to medium grained light gray bedded dolomite, coarse grained, light gray non-bedded dolomite, gray limestone. "Zebra rock" common. Usually contains galena and sphalerite in at least trace amounts. Pyrite only locally abundant. Calcite masses common. Abundant sedimentary and diagenetic breccia.
  - Gray Limestone Unit — 0 to 1500 ft.
    - Gray massive limestone contains some beds of intermixed crystalline and bedded dolomite. This unit is found only in the western half of the district except for minor exposures in the Slate Creek area.
  - Bedded Dolomite Unit — 3500 ft.
    - Fine to medium grained, light gray dolomite; in places well bedded. Contains some beds, lenses and pods of black dolomite with white spots and blotches. Zebra rock fairly common. This unit is the thickest of Metaline Formation.
  - Bedded Limestone Unit — 1000 to 1200 ft.
    - Thin to medium bedded gray to dark gray limestone and some limy shale. Grades downward into Maitlen Phyllite.
- Maitlen Phyllite — 5000 ft.
  - Greenish gray phyllite principally; beds of limestone near top and platy quartzite near base.
- Gypsy quartzite — 5300 to 8500 ft.
  - Quartzite and grit with some beds of conglomerate, schist, and phyllite

Cambrian (?)
- Monk formation — 3800 ft.
  - Principally phyllite; quartzitic limestone near top; conglomerate at base
  - Unconformity

PreCambrian
- Leola volcanics — 5000 ft.
  - Predominantly greenstone, with green schist
- Shedroof conglomerate — 5000 ft.
  - Volcanic conglomerate, phyllite, quartzite, and greenstone
  - Unconformity
- Priest River group — Thickness not known
  - Phyllites, quartzites, greenstone, and limestone

FIGURE A5.

Stratigraphic Section
Metaline District, Washington

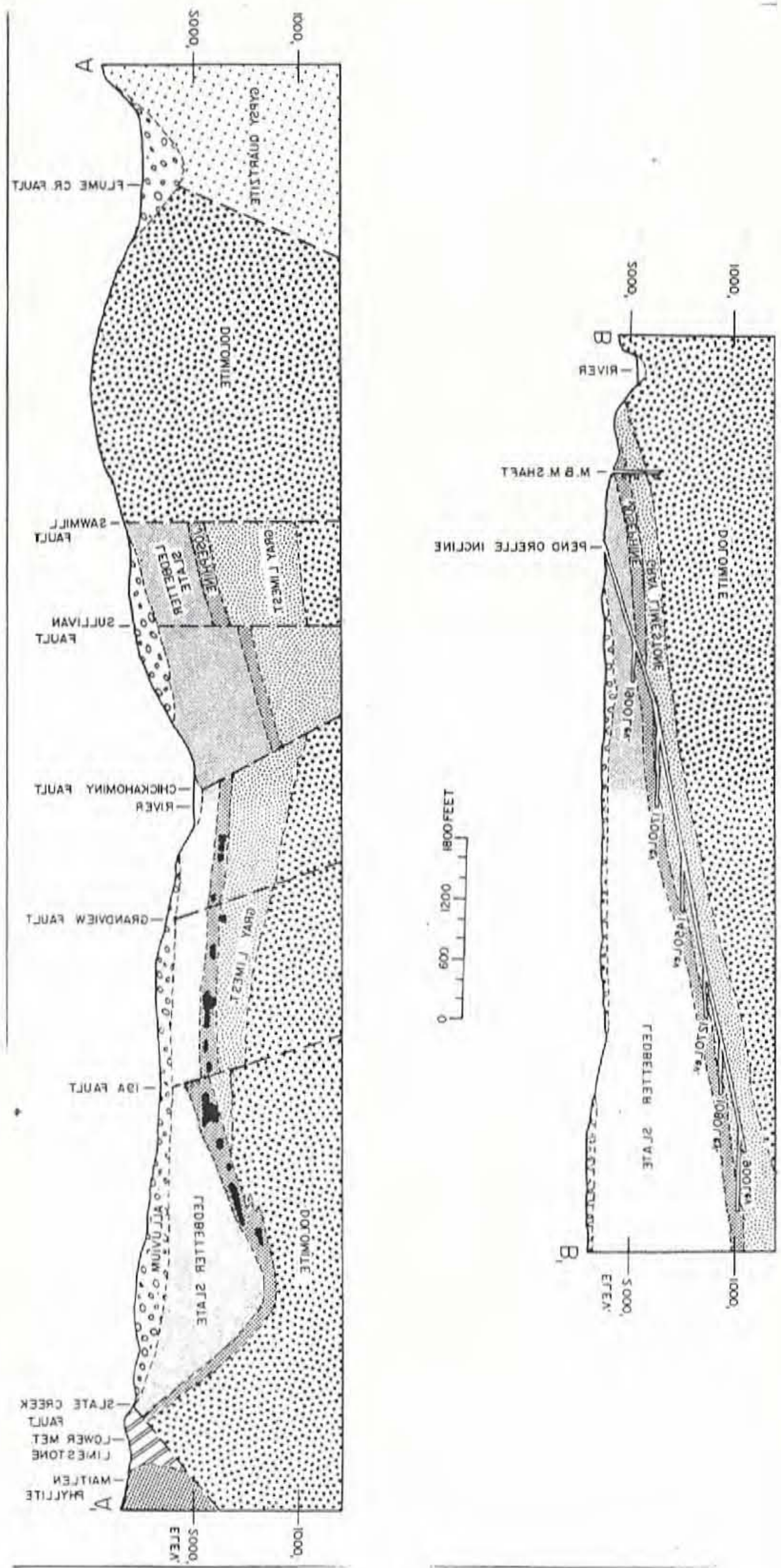
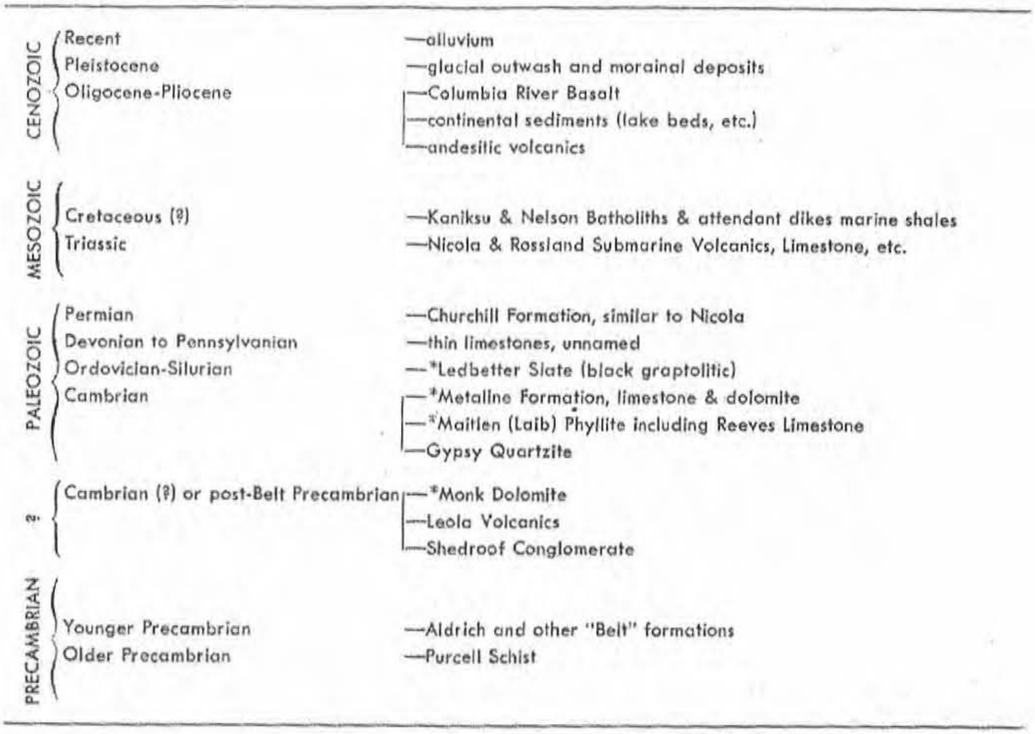


FIGURE A6

Cross-Sections
Pend Orelle-Grandview Mine

From McConnel and Anderson, 1968



*** Host Rocks for Zinc-Lead Deposits**

FIGURE A7. Stratigraphic Section, Selkirk Zinc-Lead Belt. From Cox, 1968

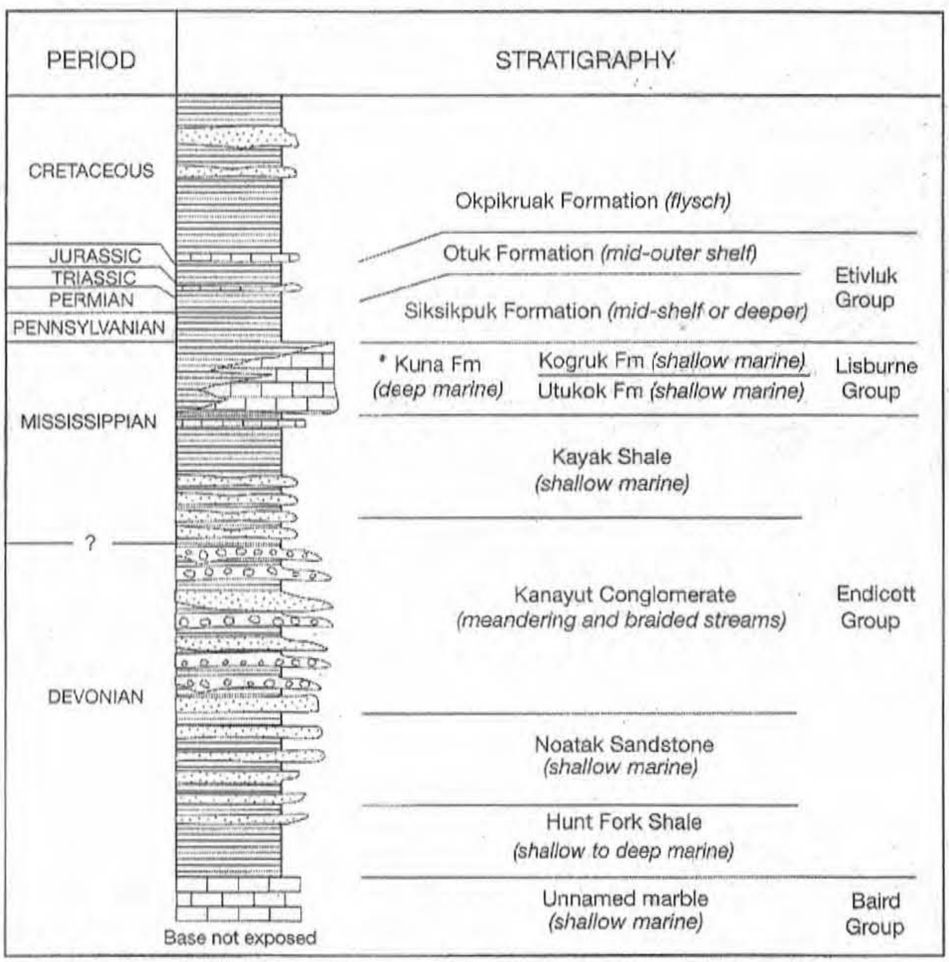


FIGURE A8. Stratigraphic Section, Red Dog District, Brooks Range, Alaska From Slack et al, 2004

Red Dog, Brooks Range, Alaska

There has been more than two decades of careful study of host rocks to approximately 140 Mt of 16.6 percent Zn and 4.6 per cent Pb as sphalerite and galena concentrated within a Paleozoic stratigraphic interval less than 25 m thick, silicic, phosphatic, with more than five weight percent organic carbon, less than three weight percent total iron and a low Fe/Ti (< 6) compared to the global average of black shale (Slack et al, 2004). Sulphur is not abundant and pyrite is minor.

The zinc-and lead-bearing black host "shale" also has a 'chert' lithofacies commonly with 90 to 95 weight percent SiO_2. The latter is generally less than 25 m thick, above the metal-bearing facies, and distal thereto. The metalliferous lithofacies is commonly underlain by a gray to black calcareous lithofacies, sulphidic in some instances, and generally a few tens of meters thick. These three lithofacies, the silicic carbon-rich metalliferous, the overlying cherty, and the underlying calcareous facies collectively have a distal lithofacies that is much less silicic, less carbon-rich, and is more iron-rich.

The interpretation is that the metalliferous lithofacies and the immediately adjacent black lithofacies are not black shales, and are not clastic accumulations in deep-water euxinic basins. Rather, they are mudstones, distinctly silicic, phosphatic, with abundant organic carbon. They are iron-poor, non-aluminous, and slightly sulphourous. They are biogenic precipitants in shallow sea water at a continental margin.

The underlying rocks are platformal limestones and dolostones. The overlying rocks are bioturbated silicic dolostones. Hence, the prospective stratigraphic interval is oxygenated except for a thin, laterally continuous reduced interval, reduced because of its abundance of organic carbon.

The prospective and productive rocks are part of the Paleozoic stratigraphic section along the continental margin (Figure A8). They were compressed by mid-Mesozoic orogeny (Figure A9) into a fold and thrust belt. It later experienced relaxation and extension. The result is ore deposits with stratigraphic and structural control (Figure A10).

Red Dog has all of the above characteristics and has had the most scientific study of any Cordilleran carbonate-hosted base metal deposit. It is therefore appropriate to study its interpreted genesis and use it where appropriate to explain Rusty Springs.

In brief, the genetic model for Red Dog includes both a syngenetic, diagenetic, and an epigenetic replacement origin (Lewchuk, 2004). Petrographic, geochemical, and isotopic data support a syngenetic model in which fine-grained stratiform barite and volumetrically minor sphalerite, galena, and pyrite are emplaced at or near the seafloor in unconsolidated mud during sedimentation and early digenesis between 340 to 330 Ma.

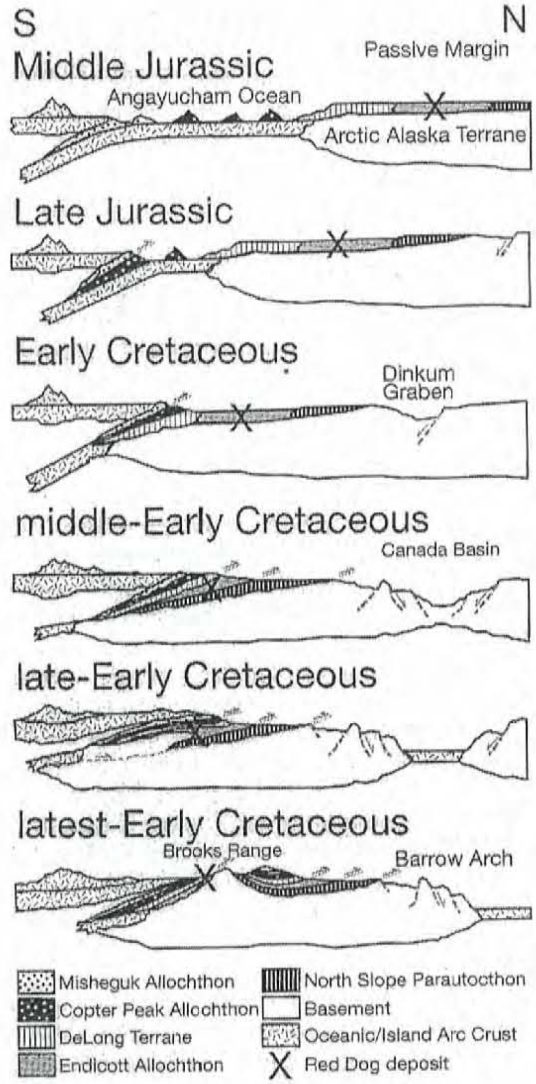


FIGURE A9. Sequence in Orogeny, Red Dog District, Alaska. From Leach et al, 2004

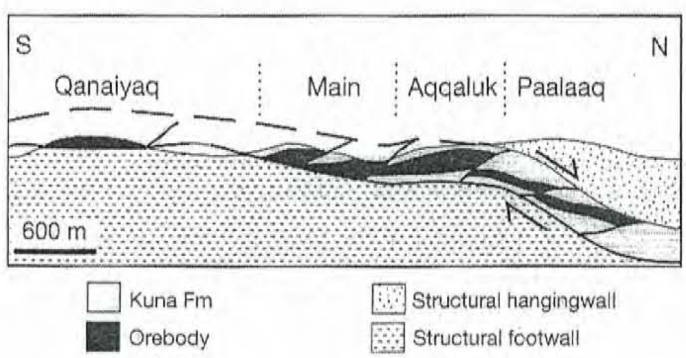


FIGURE A10. Distribution of Red Dog Deposits From Kelley and Jennings, 2004

Early barite formation was followed by a main stage infusion of metal-rich fluids that replaced carbonate with massive sulphide at 338 Ma. This event took place entirely subseafloor during lithification and diagenesis. Late in this main stage of mineralization there was pervasive replacement of barite by sphalerite and the formation of sulkphide-bearing quartz veins (Dumoulin et al 2004, Kelley et al, 2004). Hydrothermal activity ceased after vein formation.

This proposed genesis involves metal-bearing brines derived from evaporates ascending along extensional faults into the carbon-rich rocks where they mixed with fluids rich in locally derived sulphur. At this site fluids precipitated sulphide minerals in open spaces and by replacement (Leach et al, 2004). The driving force behind the mineralizing fluids was compression of the marginal basin during orogeny, in other words, through the dewatering of the marginal basin. Fluid flow was continent-ward into chemically and physically reactive rocks. This genesis can be applied to most of the known zinc-lead deposits of the Selwyn Fold and Thrust Belt.

Polaris, Canadian Arctic Archipelago

Polaris is at tidewater on the southwest edge of Little Cornwallis Island, District of Franklin (Randell and Anderson, 1996). It was 22 mt of 14% Zn, 4%Pb, and 5% Fe as sphalerite, wurtzite, galena, and marcasite, discovered in 1960, brought into production in 1981, and mined out in the early 2000's. Polaris is only economic deposit amongst 19 occurrences that make the Cornwallis Lead-Zinc District within the Cornwallis fold belt (Kerr, 1977).

The Polaris ore body is in the Upper Thumb Mountain Formation, an Ordovician biowackestone, burrowed, containing the alga *Gloecapsamorpha,* plus rugose corals, gastropods, cephalopods, brachiopods, bivalves, and trilobites (Figure A11). It is up to 90 m thick and is overlain by 60 m of mudstone and shale of the Irene Bay Formation.

The Polaris orebody is 800 m in strike length, 300 m down dip, and varies in thickness from 40 to 150 m. It has a halo of dolomitic limestone. There is a zonation of clay minerals from proximal coarse hydrothermal kaolinite outward to sedimentary illite (Randell et al, 1996). Rb/Sr ages for sphalerite, paleomagnetic studies, and paragenetic relationships all suggest a late Devonian age for emplacement of the orebody. There is both a pre- and post- late Devonian folding. Large amplitude folds with faults along their limbs disrupt a regional dip of 15 degrees (Figure A12).

Polaris is interpreted as a deposition from tectonically driven, oxidized, metal-bearing evaporative brines that were reduced and sulphurized upon encountering alga in limestone, and that deposited metal sulphides in dissolution cavities and fractures.

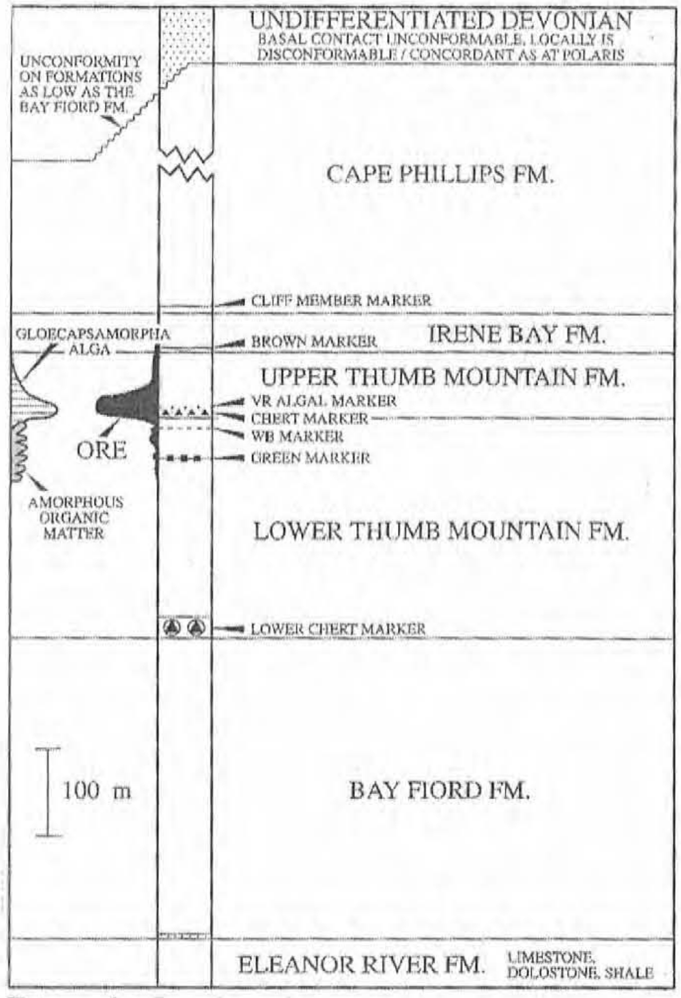


FIGURE A11. Stratigraphic Section for the Polaris Zn-Pb Deposit, Canadian Arctic Archipeligo. From Randell and Anderson, 1996.

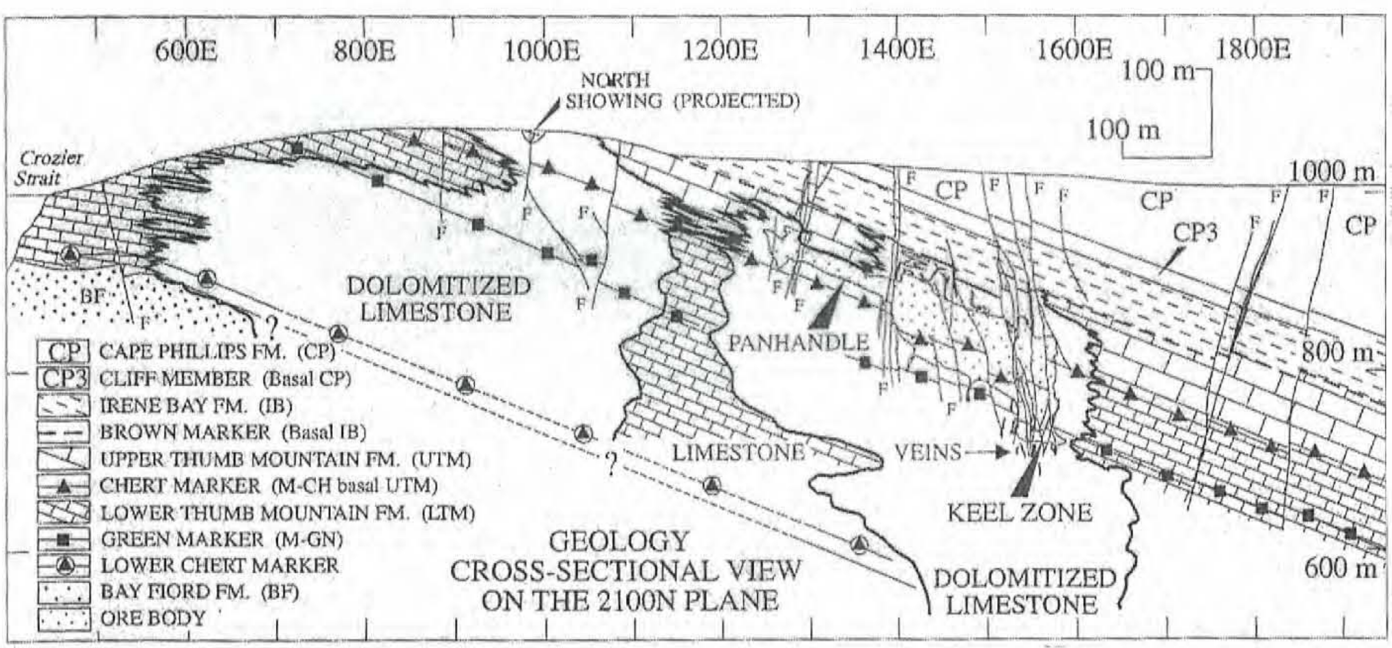


FIGURE A12. Cross-Section through Polaris on 2100N, Looking North From Randell and Anderson, 1996

APPENDIX B

Summary of Exploration Work Done at Rusty Springs: From Private and Published Repoprts

Year	Work done	Company	Interpretations	Drilling	Significant results	Expenditure	Reference
1976	staking, prospecting, mapping, limited soil sampling, hand-pitting	Rio Alto Exploration Ltd.	intrusive-related hydrothermal vein systems with supergene enrichment possibilities		Chip samples of float from several localities with 30-40% Zn, 5-15% Cu, and variable Pb and Ag; grab samples commonly averaged 10-70 opt Ag	$150,000	Chernoff (1976)
1977	prospecting, mapping, grid soil sampling, diamond drilling, staking, metallurgical sampling	Rio Alto Exploration Ltd.	precious metal enriched Mississippi Valley type (MVT) model adopted	3,200 ft. (975 m) in 8 holes	High Ag and Pb values in one hole (123 ft. averaging 33.27 opt Ag, 4.72% Pb, 2.36% Cu) but with poor recoveries	$187,000	White (1978); Schoel (1978)
1978	extensive linecutting and soil geochemistry, prospecting, diamond drilling, mapping, construction of winter road and airstrip	Rio Alto Exploration Ltd.	mineralized zones on Orma hill follow low angle "fault"; MVT model still accepted	6035 ft. (1,840 m) in 30 holes	stratigraphic control noted on anomalous soil geochem zones following "chert"–dolomite contacts: Cu-Pb-Ag±Zn on Orma hill; Zn±Cu±Pb±Ag on Mike hill; poor recoveries in drilling	$555,000	Beck (1978)
1979	Induced Polarization and gravity surveys, linecutting, prospecting, mapping, soil sampling, hand pitting, trenching	Rio Alto Exploration Ltd.	MVT model still accepted		extent of upper Ogilvie Formation (mineralized showings or float found throughout) and contacts with overlying siliciclastic rocks established	$300,000	Hansen and Bankowski (1979), White (1979)
1980	diamond drilling, cat trenching, detailed mapping	E&B Explorations Inc. and Rio Alto Exploration Ltd. joint venture	mineralization considered to be of hydrothermal origin; Ogilvie-Hart River contact still considered a karsted horizon channeling mineralizing solutions	6,000 ft. (1829 m) in 27 holes	poor recoveries in upper parts of holes; numerous cm- to decimetre thick tetrahedrite-tennantite veins intersected and which commonly yielded high Ag, Pb, and Cu values; mineralization on Orma hill in part appears to be vein-related	$1,200,000	Bankowski (1980), Liedtke (1980)
1982	soil geochemistry, VLF-EM surveys, mapping, trenching, diamond drilling	Kenton Natural Resources Corporation	epithermal veins	1673 ft. (510 m) in 7 holes	common WNW, NW, and NNW trending EM conductors outlined; Orma hill vein systems defined	$116,000	Davis and Aussant (1982)
1983	fill-in soil geochemistry and VLF-EM surveys, diamond drilling	Kenton Natural Resources Corporation	epithermal veins	1600 ft. (488 m) in 2 holes	focused on Orma Hill vein systems	$350,000	Aussant (1983)
1986	diamond drilling	Kenton Natural Resources Inc.		1326 ft. (404m) in 2 holes	tested (unsuccessfully) IP anomalies between Orma and Mike hills	$96,000	Chamberlain (1986)
1992	restaking						

1994	regional reconnaissance; trenching, airstrip and road construction; clean-up	Eagle Plains Resources Ltd.	epithermal veins, MVT		vein mineralization on 040°trend discovered using soil geochem and trenching on Mike Hill; new showings discovered SW of Mike Hill	$190,000	Downie (1994)
1995	trenching, diamond drilling, soil geochemistry, staking, airstrip and road construction, GPS survey, claim staking	Eagle Plains Resources Ltd.	manto-chimney type carbonate hosted deposits	5440 ft. (1658 m) in 21 holes	15.1 oz/ton Ag, 3% Cu, and 1.3% Zn over 50 ft. (15.3 metres) on Mike Hill	$539,000	Termuende (1996)
1996	diamond drilling; airstrip extension, road construction, staking	Eagle Plains Resources Ltd.	carbonate-hosted manto type deposits; stratabound hydrothermal mineralization along Ogilvie-Hart River Formation contact	7610 ft (2320 m) in 15 holes	highly anomalous base metal values over significant widths along Ogilvie-Hart River Formation contact	$560,000	Termuende and Downie (1997)
1997	reverse-circulation drilling, surface mapping, prospecting, road and drill pad construction, improvments to airstrip	Eagle Plains Resources Ltd. and Canaustra Resources Ltd.	stratabound hydrothermal mineralization along Ogilvie-Hart River Formation contact	1351 feet (412 m) in 8 holes	two widely spaced holes drilled through Ogilvie-Hart River Formation contact, confirming presence of stratbound mineralization; affirmation of distribution of chert and shale, including in low-lying areas (may cap mineralization preserved beneath the water table)	$356,000	Termuende and Downie (1998), Hodder (1997)
1998	gravity and seismic reflection surveys, property reconnaissance prospecting and mapping	Eagle Plains Resources Ltd. and Canaustra Resources Ltd.	stratabound hydrothermal mineralization along Ogilvie-Hart River fm contact, below present and paleo-water tables		continuation of prospective stratigraphy at shallow depths northeast of Orma hill; coincident with gravity anomalies	$54,000	Power (1998)
1999	diamond drilling, property-scale mapping, regional reconnaissance mapping, prospecting, and sampling; clean-up	Eagle Plains Resources Ltd. and Canaustra Resources Ltd.	stratabound hydrothermal mineralization along Ogilvie-Hart River fm contact, below present and paleo-water tables	1040 ft. (317 m) in 3 holes	drillhole north of Orma Hill intersects disseminated sphalerite in Devono-Mississippian shale microbreccia overlying the Ogilvie Formation	$273,000	Downie and Greig this report
				total drill footage: 35,280 ft. (10,750 m) in 123 holes		total expenditures: $4,927,000	

Exploration Methods Employed on the Rusty Springs Property

Method	Aim of survey/application	Results and comments	Recommendations
prospecting	locating mineralization	successful in locating silica-hosted vein-type mineralization	useful for following-up geochem
soil geochemistry	to locate potential mineralized zones and target trenches and drillholes	in spite of thick overburden and permafrost, effective in outlining near-surface mineralization	target top of Ogilvie Fm on remaining unsampled parts of property
stream geochemistry	location of new drill targets	creek sampling led to discovery of new showings local to property; geochemically anomalous drainages present in region	regional stream sediment sampling, targeting Ogilvie Fm. and overlying shale
trenching	to reach bedrock	mixed success with cat trenching: bedrock exposure not guaranteed; may require 2 seasons; environmental degradation problems	any further trenching may be more successful using an excavator
geophysics	targeting drillholes	most geophysical anomalies tested were coincident anomalies	
IP	targeting sulphides	resistivity anomalies outlined, but drill testing unsuccessful	not recommended without sound geologic framework
VLF-EM	targeting conductive sulphide horizons	many conductors outlined, but drill testing unsuccessful; may outline water-filled gougy fault zones	not recommended without sound geologic framework
magnetometer	??was this done??		not recommended without sound geologic framework
gravity	targeting more dense sulphides	anomalies outlined, but drill testing unsuccessful	several anomalies untested; not recommended without sound geologic framework
seismic	determining depth to favourable stratigraphic contact	unsuccessful, possibly imaged permafrost horizon	not recommended without sound geologic framework
drilling			
diamond drilling		reasonable drilling and recovery in oxidized mineralized zones using modern equipment and drilling techniques; drilling slow in resistant siliceous zones	recommended for future work; need high-powered rig, plenty of casing, mud, bits, core barrels, and patience
RC drilling		difficult drilling in oxidized mineralized zones; good drilling in resistant siliceous zones	not recommended

Yukon Assessment Report Checklist

Front Covers (Report and CD) require the following information:

- [x] Nature of Report – Drilling, Geological, Geophysical, Geochemical.
- [ ] Name and grant numbers of claims
- [x] 1:50,000 NTS Mapsheet Number
- [x] Latitude and Longitude or UTM Coordinates
- [ ] Registered owner
- [x] Mining District
- [x] Authors
- [x] Dates work performed

Common to all reports:

- [x] Table of Contents
- [x] Introduction with specific objective of the survey(s).
- [x] Summary of previous investigations (history).
- [ ] List of claims with grant numbers, name of registered claim holder and the operator (who paid for the work).
- [x] Reference to available geology (local and regional).
- [x] Description of data collected (geochemical, geological, geophysical), method of collection, equipment and procedures.
- [ ] If applicable, copy of digital data collected in digital format. (GPS data with datum, geophysical readings, etc.)
- [ ] Copy of assay certificates.
- [x] Interpretation and conclusions.
- [ ] Claim map with topography, claim names and grant numbers.
- [ ] Sample location map.
- [x] Signed statement of qualifications.
- [ ] Statement of expenditures.
- [x] References

Maps must include the following information:

- [x] scale
- [x] north arrow
- [x] reference points (lat/long or UTM with datum)
- [x] legend
- [ ] Traverse line (prospecting).
- [ ] Grid or cut lines.

Specific Surveys
Geological/Geochemical Surveys

- [x] Sample descriptions (silt, soil, rocks, vegetations, etc.).
- [ ] Description of assay methods.
- [x] Geological map with outcrops outlined identifying lithology, structure, and mineralization.
- [x] Prospecting must include a map showing location of any traverses, location of rock outcrops, subcrops etc with observations.
  Helicopter stops

Geophysical Surveys

- [ ] Geophysical readings or profiles (raw data plus any corrections and/or calculations)
- [ ] Full description of the type of survey.
- [ ] Airborne surveys – results plotted in contour form at an appropriate scale.

Drilling

- [ ] Drill logs with collar location, elevation, inclination/azimuth at collar and in any downhole surveys, core size/diameter.
- [ ] Location of drill core/cuttings storage.
- [ ] Assay results correlated with drill logs (note if assays not performed).
- [ ] Drill hole location map

CERTIFICATE OF QUALIFICATION

I, Robert W. Hodder of 22 Mayfair Drive, in the city London in the Province of Ontario N6A 2M7, hereby certify:

I am a Professional Geoscientist registered with the Association of Professional Geoscientists of Ontario (#1170), a Professional Engineer registered with the Professional Engineers of Ontario (#19934017), and a Professional Geologist registered with the American Institute of Professional Geologists (#CPG-02079).

I am a graduate of Queens University with a B.A. (Hons. Geology, 1955) and the University of California, Berkeley (PhD. Geology, 1959). I have practiced my profession as a geologist since graduation.

This report is supported by data collected in the field in 1997 and 2009 and information gathered through laboratory and library research.

I do not have any direct interest in the Rusty Springs and Alto prospects and I do not hold any shares of Eagle Plains Resources Ltd.

Dated this 25th day of August, 2009 in London, Ontario, Canada

PROFESSIONAL ENGINEER
R. W. HODDER
PROVINCE OF ONTARIO

PROFESSIONAL GEOSCIENTIST
ROBERT W. HODDER
PRACTISING MEMBER
1170
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