## AIRBORNE GEOPHYSICAL SURVEY REPORT <br> (Electromagnetic and Magnetic Survey)

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## Gold Commissioner's Offiqudddock CREEK PROPERTY

 VANCOUVER, B.C. on theTenure Nos. 516176, 516624 and 518989

## Kamloops Mining Division

NTS: 82M/15W
B.C. Geographic System Map Sheet: 082M. 076

Latitude: $\mathbf{5 1}^{\circ} \mathbf{4 6 . 5}$ ' N ; Longitude $118^{\circ} \mathbf{5 6}^{\prime} \mathrm{W}$ UTM (NAD 83): 5737750 N; 366750 E; Zone 41

## Vendor: Doublestar Resourcestitd.

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TABLE OF CONTENTS

| Section |  | Title | Page |
| :---: | :---: | :---: | :---: |
| A | Report | Introduction | 3 |
|  |  | Property | 3 |
|  |  | Location and Access | 3 |
|  |  | Climate, Topography and Vegetation | 4 |
|  |  | History | 4 |
|  |  | Regional Geology | 7 |
|  |  | Property Geology | 7 |
|  |  | 2005 Airborne Survey Area | 13 |
|  |  | Geophysical Survey | 13 |
|  |  | Conclusions | 14 |
|  |  | Recommendations | 14 |
|  |  | References | 17 |
|  |  | Statement of Qualifications | 19 |
|  | Tables | 1. Summary of Activities | 6 |
|  |  | 2. Metavolcanic / Metasedimentary Units | 9 |
|  |  | 3. Intrusive Units | 13 |
|  |  |  |  |
| B | Property | Schedule of Mineral Claims | 20 |
|  |  |  |  |
| C | Expenditures | Statement of Expenditures | 24 |
|  |  |  |  |
| D | Geophysical Reports | Technical Report on a Helicopter-Bome AeroTEM II Electromagnetic and Magnetic Survey on the Ruddock Creek Property by Aeroquest Limited dated May 2005 | 25 |
|  |  |  |  |
| E | Illustrations |  |  |
|  | Plan Number | Title | Scale |
|  | RC-06-1 (after p. 4) | General Location Plan | 1:250000 |
|  | RC-06-2 (after p. 4) | Location Plan | 1:50000 |
|  | RC-06-3 (after p. 4) | Mineral Claims | 1:50000 |
|  | RC-06-4 (in pocket) | Mineral Claims / 2005 Airborne Survey Area | 1:20000 |
|  |  | Geophysical Report: |  |
|  | Map 1 | Total Magnetic Intensity | 1:10000 |
|  | Map 2 | First Vertical Derivative of TMI | 1:10000 |
|  | Map 3 | AeroTEM Z1 Off-Time | 1:10000 |
|  | Map 4 | AeroTEM Off-Time Profiles | 1:10000 |

## SECTION A: REPORT

## INTRODUCTION:

The Ruddock Creek Property (the "Property") is a "Sedex-Type" stratabound lead-zinc deposit owned by Doublestar Resources Lid. ("Doublestar"). Selkirk Metals Holdings Corp. ("Selkirk Holdings" or "the Company") holds an option to acquire up to a $70 \%$ interest in the Property from the owner under the terms of an Option and Joint Venture Agreement dated June 10, 2004. The option was originally acquired by Cross Lake Minerals Ltd. ("Cross Lake") but was assigned to Selkirk in June 2005 as a result of a Plan of Arrangement. This report documents an airborne electromagnetic and magnetic survey that was initiated by Cross Lake in May 2005. The survey contractor was Aeroquest Limited of Milton, Ontario. The work was carried out primarily on Tenure Nos. 516176, 516624 and 518989. A total of 225.87 line km was flown.

## PROPERTY:

The Ruddock Creek Property is comprised of seven cell claims containing an aggregate of 187 celis and covering a gross area of 3739.059 hectares. These claims represent the conversion in July 2005 of two 4 post mineral claims ( 15 units) and 59 two post claims into one cell claim of 79 cells and the acquisition in July and August 2005 of two cell claims containing 26 cells and the further acquisition in April 2006 of four claims containing 82 cells. The claims are located primarily in the Kamloops Mining Division but a small portion of the Property extends eastward into the Revelstoke Mining Division. The original 2 post claims were staked from October 1960 to September 1962 and the two 4 post claims in June 1977. The claims are registered in the name of Selkirk Metals Holdings Corp. during the currency of the Option Agreement. The claims are shown on Plan Nos. RC-06-1 to RC-06-4 contained herein. The details of the mineral claims that comprise the Property are set out in Section B of this report. The expiry dates shown are based on the Statement of Work filed on May 11, 2006 as Event \#4083589 and assume that the work contained in this report will be accepted for assessment purposes.

## LOCATION AND ACCESS:

The Ruddock Creek Property extends from the headwaters of Ruddock Creek westerly across the Oliver Creek Valley to the Mammoth Creek drainage in the Scrip and Seymour Ranges of the Monashee Mountains in southeast British Columbia. The main area of the Property is located approximately 100 km north-northwest of Revelstoke, 28 km east of Avola and 6.5 km west of Gordon Horne Peak. The claims are situated on NTS map sheets $82 \mathrm{M} / 14 \mathrm{E}$ and 15 W and BCGS map sheets 082M075, 076 and 085.

Geographic coordinates at the centre of the airborne survey area are $51^{\circ} 46.5^{\prime}$ north latitude, $118^{\circ} 56^{\prime}$ west longitude and the UTM coordinates (NAD 83) are 5737750 N and 366750 E in Zone 11 .

There is no direct road access to the eastern portion of the Property although a logging road has now advanced from the Adams River up the Oliver Creek Valley to the central portion of the claim holdings.

## CLIMATE, TOPOGRAPHY AND VEGETATION:

The climate in the area is temperate with generally warm summers and cool, wet winters. Substantial snow accumulations are the norm, thus limiting the fieldwork season to mainly August and September. Permanent snow cover exists on some of the higher areas of the Property.

The claims are situated in extremely mountainous terrain at the height of land between the drainages of the Columbia River and Fraser River systems. The terrain is characterized by heavily timbered lower slopes and steeper alpine-glaciated upper slopes. Elevations range from 880 m above sea level at the northwestern edge of the claims in the Oliver Creek drainage to 2854 m on an unnamed peak at the northern edge of the holdings. The terrain is extremely steep in some areas making access very difficult. A number of small alpine lakes or tarns dot the area. Water supply from streams fed by glacial and snow melt varies according to elevation and time of year. A small lake exists at the E Zone and forms an adequate reservoir for driliing purposes.

The vegetation is mainly in the western one third of the claims below the 1900 m level and consists primarily of subalpine Balsam Fir, Spruce, Hemlock and Western Red Cedar. Vegetation is limited to heather and stunted shrubs in the lower alpine regions above tree-line and in the upper areas the ground is either barren rock or is covered by permanent neve snow, smali glaciers or glacial moraine and rock talus.

## HISTORY:

Exploration on the Ruddock Creek Property dates from the discovery of massive sulphide mineralization and the subsequent staking of the ground in 1960 by Falconbridge. The most extensive exploration was conducted by Falconbridge over the period 1961-1963. During this phase of exploration, most of the property was mapped at scales ranging from 1:240 $\left(1^{\prime \prime}=20^{\prime}\right)$ to $1: 4800\left(1^{\prime \prime}=400^{\prime}\right)$. Core drilling was completed at the E Zone, and the $\mathrm{F}, \mathrm{G}, \mathrm{M}, \mathrm{T}, \mathrm{Q}, \mathrm{U}$, and V showings (see summary in Table 1). Falconbridge completed detailed 1:480 $\left(1^{\prime \prime}=40^{\prime}\right)$ geological cross sections through the E Zone area during its exploration program, as well as several property-scale sections showing stratigraphic and structural correlations of the massive sulphide interval between the different showings. They also



constructed structure contour maps of the subsurface projection of the E Zone, in order to better target portions of the mineralization offset by faulting.

Cominco Ltd. optioned the property from Faiconbridge in 1975 and completed two additional drill holes plus a wedged hole in 1975 and 1976 expioring for deep extensions to the E Zone. Cominco also conducted additional detailed mapping at the F and G showings and calculated an "indicated potential" for the E Zone of 1.5 MT grading $10 \% \mathrm{~Pb}+\mathrm{Zn}$, increasing to 3.0 MT if the E Zone is projected westward to the E Zone Fault (Mawer, 1976). In 1977 Cominco carried out further drilling on the Upper and Lower G Zones as well as the F and T Zones. Cominco contracted a structural evaluation of the property in 1978 (Marshall, 1978). This study corroborated many of the general interpretations made by Falconbridge and also provided additional detail to the interpretation of lithologic sequence, structural fabrics and folding history. Cominco also conducted a small program of surface and bore hole geophysics in 1982. Cominco's interest at this time was $40 \%$ and subsequently increased to $41.1 \%$.

Doublestar Resources Lid. acquired Falconbridge's $58.9 \%$ interest in January 2000 and in August and September 2000 carried out a detailed structural mapping program on the Property. In February 2001, Doublestar purchased the $41.1 \%$ interest of Cominco to hold a $100 \%$ interest in the Property, subject only to a $1 \%$ Net Smelter Royalty in favour of Cominco.

In March 2004, Cross Lake acquired an option on the Property from Doublestar and in August and September 2004 completed an 11 hole NQ drill program on the E Zone totalling 1838.7m.

Selkirk Holdings continued work on the Property in 2005. An helicopter-borne AeroTEM II Electromagnetic and Magnetic survey was flown by Aeroquest Limited in May, four deep drill holes ( 3245.4 m ) were completed on the E Zone Extension during July, August and September and a geological mapping, geochemical sampling and UTEM-3 geophysical survey program was conducted in the Oliver Creek Valley in September and October.

Table 1 summarizes work and drilling completed to date on the Ruddock Creek Property. An aggregate of 138 holes totalling $14,626 \mathrm{~m}$ have now been drilled, with the E Zone and $\mathrm{G}, \mathrm{M}, \mathrm{T}, \mathrm{U}, \mathrm{R}, \mathrm{V}$, and Q zones represented. Drill core was stored on site but, other than the most recent drilling, is generally in poor condition.

| Ruddock Creek Property: Summary of Activities |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Company | $\begin{aligned} & \text { Area or } \\ & \text { Zone } \end{aligned}$ | Type of Work | Drilling |  |  |
|  |  |  |  | Holes | Hole Numbers | Metres |
| 1960 | Falconbridge |  | Prospecting, staking |  |  |  |
| 1961 | Falconbridge | E, M, T | Prospecting, geological mapping, drilling | 37 | $\begin{array}{\|l} \hline \mathrm{E}-1 \text { to } 19 \\ \mathrm{M}-1 \text { to } 15 \\ \mathrm{~T}-1 \text { to } 3 \end{array}$ | $\begin{array}{r} \hline 813 \\ 104 \\ \underline{23} \\ 940 \\ \hline \end{array}$ |
| 1962 | Falconbridge | E, Q, T | Drilling, hand stripping and trenching | 27 | $\begin{aligned} & \text { E20-33, 33A-37 } \\ & \text { Q-1 to } 3 \\ & \text { T-4 to } 8 \end{aligned}$ | $\begin{array}{r} 1130 \\ 84 \\ \underline{80} \\ 1294 \\ \hline \end{array}$ |
| 1963 | Falconbridge | $\begin{aligned} & \text { Eext., R, } \\ & \text { Q, U,V } \end{aligned}$ | Drilling, hand stripping and trenching | 25 | $\begin{array}{\|l} \hline \text { ED-1 to } 8 \\ \text { Q-4 to } 13 \\ \text { R-1 to } 3 \\ \text { U-1 to } 3 \\ \text { V-1 } \end{array}$ | $\begin{array}{r} 3229 \\ 347 \\ 67 \\ 37 \\ \underline{8} \\ \hline 3688 \\ \hline \end{array}$ |
| 1973 | Cominco |  | Aeromagnetic survey of western portion | - |  |  |
| 1975 | Cominco | Eext. | Drilling | 1 | C-1-75 | 694 |
| 1976 | Cominco | Eext. | Drilling | 2 | C76-1, 76-1A | 1372 |
| 1977 | Cominco | Upper G, <br> Lower G, F, T | Drilling, geological mapping, prospecting | 31 | UG77-1 to 12 <br> LG77-1 to 8 <br> F77-1 to 5 <br> T77-1 to 6 | $\begin{array}{r} 832 \\ 377 \\ 156 \\ 1 \quad 189 \\ \hline 1554 \\ \hline \end{array}$ |
| 1978 | Cominco |  | Structural study | - | - | - |
| 1982 | Cominco |  | Limited surface and bore hole geophysics | - | - |  |
| 2000 | Doublestar |  | Geological mapping and structural analysis | - | $-$ |  |
| 2004 | Cross Lake | E | Drilling | 11 | $\begin{array}{\|l} \hline R D-04-101 \text { to } \\ \text { RD-04-111 } \\ \hline \end{array}$ | 1839 |
| 2005 | Selkirk | Complete property | Airborne geophysical survey: AeroTEM II EM and Mag ( 232.2 line km ) |  |  |  |
| 2005 | Selkirk | E ext. | Drilling | 4 | $\begin{aligned} & \text { RD-05-112 to } \\ & \text { RD-05-115 } \end{aligned}$ | 3245 |
| 2005 | Selkirk | Oliver Cr . | Geological mapping and sampling ( $500 \times 1800 \mathrm{~m}$ ) |  |  |  |
| 2005 | Selkirk | Oliver Cr . | Geochemical sampling |  |  |  |
| 2005 | Selkirk | Oliver Cr. | Geophysical survey: UTEM-3 ( 18.575 line km) |  |  |  |
| Total |  |  |  | 138 |  | 14626 |

## REGIONAL GEOLOGY:

The geologic and structural description outlined below is summarized from the BCDM Bulletin \#57 by J.T. Fyles (1970).

The deposit lies in metasedimentary rocks of the Shuswap metamorphic complex on the northwest flank of the Frenchman Cap Gneiss Dome. The Dome is elongate with the long axis trending north-northwest, paraliel to the Columbia River. In the northern area of the "Dome" the core gneisses lie beneath gently northerly dipping metasedimentary rocks which grade upward into metasedimentary rocks containing abundant pegmatite. This pegmatite rich zone covers wide areas between the Columbia River and Oliver Creek.

Pegmatite and medium-grained granitic rocks make up more than $50 \%$ of the outcrops. These rocks represent mainly if not entirely partial melting of the metasediments. Rock units and structures can be projected and traced among the pegmatite sheets without significant displacement. The abundance of pegmatite and very few distinctive marker beds, except for the sulphide layers in the sedimentary rocks, translates into correlations that are largely interpretive.

The structure of the area is dominated by repetitive folding, which took place during metamorphism, and was followed by faulting. The earliest folds called Phase I are isoclinal and obscure and tend to thicken the sequences in the hinge Zone as one does in the E Zone. The later folds, called Phase II, more open and abundant on all scales. Faults in the area are of two types, thrusts and normal. The E Zone Fault is an example of a late normal block fault, which strikes northerly and dips $58-60$ degrees west. Phase I isoclinal folds, with thickened hinge Zones and sheared out limbs have large indicated strike lengths usually measured in kilometres. These structures were refolded and tightened by Phase II folding. The formation of granite probably began late in the Phase II deformation, or after it, along with the development of pegmatites. It is likely that the development of the penetrative gneiss dome to the south contributed directly to the high degree of metamorphism and structural complexity of the area.

## PROPERTY GEOLOGY:

During a three week period, August 18 to September 4, 2000, Peter Lewis, P.Geo. was contracted by Doublestar to complete property scale mapping on the Ruddock Creek Property. His study focused on evaluating the structural history of the property with the objective of defining controls on the distribution of massive sulphide bodies. Lewis was also able to define and group rock units from previous geologists on the Property into mapable units that he used in creating property scale maps. Mapping was completed
for the eastern portion of the property, including the E Zone and $\mathrm{F}, \mathrm{G}$, and M showings, at $1: 5,000$. The area surrounding the E Zone was also mapped at $1: 2,500$ to provide more detailed control on the lithologic successions and structural features present in the area of greatest economic interest. The T showing area was mapped at $1: 5,000$ and a reconnaissance visit to the $U$ showing was completed. A description of the stratigraphy and intrusive units as defined by Lewis follows:

## Stratigraphy and Intrusive Rock Units:

The Ruddock Creek Property contains a variety of amphibolite-grade metasedimentary and metavolcanic rocks, cut by granitic intrusions that range texturally from fine-grained to pegmatitic. Contacts between lithologic units of the metamorphic succession are difficult to follow in many areas due to the high proportion of granitic intrusive rocks.

Intense deformation and metamorphism have obliterated any primary facing direction indicators in the metasedimentary and metavolcanic rocks. Structural repetition, due to both folding and thrust faulting, is documented in several locations on the property and could easily occur elsewhere where it is not yet recognized. Therefore, the metamorphic rock sequence portrayed on the property map and described below is best considered a structural sequence, composed of units with uncertain stratigraphic relationships.

The metasedimentary and metavoicanic rocks on the property comprise schists, gneisses, and quartzites, which can be divided into seven compositionally distinct lithotypes (Table 2). Individual lithotypes can form layers as thin as a few centimetres, to as thick as several tens of metres. Most lithotypes occur at multiple levels within the section, and thus the individual lithotypes do not comprise map units in a formational sense; however, they do form the basic map units shown on map sheets 1 and 2. Because of constraints imposed by the scale of mapping, only lithotypes greater than 2-3 m thick are shown on map sheet 1. Lithologic intervals composed of lithotypes that alternate in thinner layers are identified according to the dominant rock type within the interval. Table 3 summarizes the lithologic characteristics of the lithologic divisions, and compares them to map units employed in previous reports.

Although the individual metamorphic lithotypes do not form unique map units, the thickness and distribution of each shows systematic variation across the map area. This variation defines three lithologic domains: the E Zone structural hanging wall domain, the E Zone structural footwall domain, and the $T$ showing domain.

## E Zone structural footwall lithologic domain:

Massive sulphides at the E Zone occur within the hinge area of a property-scale, recumbent, tight to isoclinal synform. $1^{\prime \prime}=40^{\prime}$ scale mapping by Falconbridge (Morris, 1965) documents inverted lithologic successions on the two opposing limbs in the immediate hinge area. However, property-scale mapping in this study shows significantly different lithologic successions on the two limbs beginning $30-50 \mathrm{~m}$ from the fold axial surface. Based on these lithologic differences and structural evidence (section 3 below), a fault sub-parallel to layering is interpreted on the lower fold limb, referred to in this report as the Camp Fault, because it crosses the area near the location of the main camp used in previous exploration. Rocks structurally below the Camp Fault are assigned to the E Zone structural footwall domain, and above, the E Zone structural hanging wall domain. The relative stratigraphic position of the lithologic sequences in the two domains is uncertain.

Table 2: Metavoicanic / metasedimentary units present at the Ruddock Creek property and correlation with previous lithologic designations

| Primary <br> Rock Type | Map Code | Description | Assignment by Morris, 1965 | Distribution |
| :---: | :---: | :---: | :---: | :---: |
| manic gneiss | mg | Thinly-banded to massive, dark green, fine-grained pyroxene $+/$ - amphibole gneiss; subordinate plagioclase; garnet common | Not differentiated; included in units QA and HGM amphibolitic guartzite, homblende-biotitegarnet schist) | Occurs structurally 100-200 m above F and G showings; $30-50 \mathrm{~m}$ above T showings |
| calc-silicate gneiss, marble | cs | Thinly- to thickiy-banded, compositionally varied unit containing alternating bands of fine- to coarsegrained quartzite, marble, diopside-rich and amphibolitic marble and quartzite | LQ (quartzitic marble) | Widely distributed through project area, occurs both structurally above and below massive sulphides |
| marble | ma | Tan to light gray, medium to very coarse-grained, massive marble, with subordinate micaceous or diopside partings | Not differentiated; included in LQ (quartzitic marble) | Forms mapable unit between F and G showings, thick units on slope structurally below E Zone |
| amphibole gneiss | ag | Thinly- to medium- banded, amphibole + plagioclase gneiss; contains garnetiferous layers; distinguished from calc-silicate gneiss by lack of calcite and by abundance of amphibole; may represent metamorphosed chloritic alteration | QA, HGM, ALQ <br> (amphibolitic quartzite and others) | Occurs as thin (not mapable) layers within calc-silicate gneiss; occurs as thick mapable unit only in hanging wall to E Zone, and pinches out abruptly along strike. |
| biotite schist | bs | Highly-schistose, coarse-grained biotite containing up to $40 \%$ by volume foliation-parallel to moderately discordant leucocratic segregations (probably both transposed veins and metamorphic segregations) consisting of fine- to medium-grained quartz and feldspar; abundant garnet in some intervals | MQ (biotite quarzite schist) | Occurs structurally above massive sulphides at E Zone and $F$ and $G$ showings, forms thick unit structurally overlying $T$ showings, and in several layers (with possible structural repetition) below $E$ Zone. |


| quartzo- <br> feldspathic <br> biotite schist | $q^{b}$ | Finely-banded to massive, schist to <br> semi-schist, consisting of quartz, <br> feldspar, and biotite in varying <br> proportions; distinguished from biotite <br> schist by finer grain size, less schistose <br> texture, and lack of leucocratic <br> segregations. | Not differentiated; <br> included in either <br> QM (quartzite, <br> slightly micaceous) <br> or MQ (biotite <br> quartzite schist) | Abundani immediately above <br> massive sulphide interval at <br> E Zone and T showings. |
| :--- | :---: | :--- | :--- | :--- |
| quartzite, <br> quartzose <br> schist | $q 7$ | Thinly- to thickly-bedded, fine- to <br> medium-grained recrystallized quartz <br> grains with variabie percentage of fine <br> biotite or amphibole grains; commonly <br> inciudes decimetre to metre thick <br> schistose, marble, and calc-silicate <br> layers not mapable at property scale; <br> gradational into quartzo-feldspathic <br> biothe schist | QZ (thin, mineralized <br> quartzite) or QM <br> (quartzite, slightly <br> micaceous) | Usually spatially associated <br> with massive or disseminated <br> sulphide mineralization; <br> thickest at E Zone |

The E Zone structural footwall lithologic domain is well exposed on the steep, southeast-facing slopes below the E Zone. It consists primarily of biotite schist, marble, and calc-silicate interlayered on the scale of several metres to several tens of metres. Minor structures, such as asymmetric secondary folds, suggest that this interlayering may be in part structural, and map sheets 1 and 2 illustrate the synformal axial trace inferred from this evidence. Both the lower and upper limbs of this fold consist of a carbonate package sandwiched within biotite schists. On the lower limb, this carbonate package is a pure light gray marble in the east, which grades westerly along strike into a two-part succession with a lower, calcsilicate gneiss division and an upper marble division. On the upper limb, the carbonate package is dominated by calc-silicate gneiss, with subordinate lenses of gray to tan marble. The biotite schist that overlies the calc-silicate gneiss on the upper limb is in turn overlain by quartzo-feidspathic mica schist containing lenses of quartzite and minor calc-silicate.

## E Zone structural hanging wall lithologic domain:

The E Zone structurai hanging wall lithologic domain is well exposed on the slopes above the E Zone and to the west of the E Zone Fault. Quartzites, micaceous quartzites, and subordinate limestone, calcsilicate, and biotite schist containing two main massive sulphide layers form the lowest rocks within the succession. Falconbidge's mapping of the E Zone (Morris, 1965) shows this lower sequence in detail. Biotite schists with minor calc-silicate and quartzo-feldspathic schist structurally overlie the quartzite + massive suiphide interval. These are in turn overlain by amphibolitic gneiss at the E Zone, which grades eastward into a sequence dominated by interlayered calc-silicate gneiss and quartzo-feldspathic schist. Highest exposed rocks in the E Zone area are calc-silicate gneisses with subordinate interlayered quartzofeldspathic schist and marble.

West of the E Zone Fault, a similar lithologic sequence is exposed in the structural hanging wall to the $F$ showing, although the large volume of pegmatite here precludes defining the sequence to the same level of detail. Displacement along the E Zone Fault has exposed higher levels here: mafic pyroxene gneisses overlie calc-silicate rocks correlated with those forming highest exposed levels to the east of the fault.

## T showing lithologic domain:

Three main lithologic units are exposed at the T showing area. Structurally lowest rocks, which contain the massive sulphide lenses, consist of quartzo-feldspathic schists with lesser quartzite, biotite schist, and calc-silicate gneiss. This package is overlain by mafic gneisses that are lithologically similar to those in the uppermost part of the E Zone structural hanging wall domain. Highest rocks in the T showing Iithologic domain are biotite schists, which are exposed over large areas and form a monotonous unit a least several hundred metres thick north of the $T$ showings.

## Correlation between lithologic domains:

The Camp Fault, which separates the E Zone structural footwall domain and the other two lithologic domains, has an uncertain offset history. The inferred fault trace is sub-parallel to lithologic contacts, consistent with formation as a thrust fault, possibly during regional folding. If so, the footwall domain may represent a higher stratigraphic level than the hanging wall domain (because it lies in the lower plate of the thrust fault, and the thick biotite schist sequences may be roughly equivalent to those in the upper part of the T showing lithologic domain. This correlation implies that the massive sulphide interval may be present at depth in the footwall domain. Because fault geometry is poorly constrained and is certainly modified by subsequent deformation, it is not possible to estimate displacement direction or magnitude.

The massive sulphide interval provides a stratigraphic tie between the E Zone hanging wall lithologic domain and the T showing lithologic domain. In both domains, massive sulphides occur within a lithologically varied interval containing quartzite, calc silicate, quartzo-feldspathic schist, and biotite schist. If the mafic gneiss interval present in both is laterally equivalent, this lithologically varied interval is significantly thicker at the E Zone than at the T showing. This might indicate that the E Zone area occupied a subbasin during massive sulphide deposition.

Amphibolite gneiss, though present as thin layers within the calc-silicate gneiss, only forms a mapable lithologic unit in the $\mathbf{E}$ Zone hanging wall domain. The localization of this rock type adjacent to the thickest known massive sulphide layers suggests that it may be a metamorphosed alteration zone, possibly originally chloritic in composition. This has two important implications: first, the occurrence of similar
rocks elsewhere on the property may be a useful exploration guide; second, the E Zone hanging wall lithologic domain, and by inference, the T showing lithologic domain, represent the original stratigraphic footwali to the massive sulphide interval.

## Intrusive Rock Units:

Intrusive rocks on the property include small, tabular, massive tremolite + actinolite bodies, and voluminous dykes, sills, stocks, and plutons of granitic composition (Table 3). The latter comprise roughly $50 \%$ of the rock present on the property (Mawer, 1976; Fyles, 1970), and are highly variable texturally and structurally. They range from planar dykes that cut shallowly or sharply across compositional layering, to large, iregular bodies containing abundant zenoliths of country rock. Grain size ranges from fine to pegmatitic, although previous workers refer to all as "pegmatites". Some of the granitic rocks possess a grain orientation fabric parallel to foliation in the adjacent country rock, and intrusive contacts are often deformed. In some areas, pegmatite occurs in lenticular boudins around which foliation wraps. Elsewhere, granitic rocks of similar composition and grain size lack any visible grain fabric, and contacts cut across folds and structural fabrics in the adjacent country rock. Together, these relationships suggest that formation of the granitic rocks was in part synchronous with, and in part outlasted deformation.

The origin of these granitic rocks has been the subject of debate among previous workers: some suggest magma emplacement within dilational fractures (Marshall, 1978), while others favour in-situ replacement of the metamorphic package (Fyles, 1970). Contact relations of the granitic rocks support both processes. Dykes can have sharp, planar contacts that cut across lithologic contacts in the metamorphic rock sequence, implying infilling of dilational fractures. However, several features indicate in-situ melting and/or replacement of the country rock:

1. Many of the zenoliths have diffuse, irregular contacts with the enclosing pegmatite.
2. Layering within adjacent zenoliths is consistently oriented.
3. Distinctive compositional layers or lithologic contacts within zenoliths can be traced through adjacent zenoliths with no apparent offset.

Massive tremolite/actinolite bodies occur on the property near the T showing and E Zone. They have tabular forms with contacts concordant to or cutting shallowly across foliation, and occur at several structural levels. Although they are very coarse-grained and lack grain orientation fabrics, they are boudinaged and their contacts are deformed. They most likely originated as ultramafic dykes, which have been transposed into their present semi-concordant geometry during subsequent deformation.

Table 3: Intrusive units present at the Ruddock Creek property and correlation with previous lithologic designations

| Primary Rock Туре | Map <br> Code | Description | Assignment by Morris, 1965 | Distribution |
| :---: | :---: | :---: | :---: | :---: |
| pegmatite/granite | pg | Highly varied: large, irregular intrusions to planar dykes; fine-grained equigranular to pegmatitic; contacts can be either tightly folded, or can cut across folds in country rock; some outcrops contain grain-orientation fabric paralled to $\mathrm{S}_{0} / \mathrm{S}_{1}$ in adjacent metamorphic rocks | $\pi$ | Occurs throughout area; volumetrically most significant in area between $G$ showings and $T$ showings, where country rock occurs only in isolated zenoliths. |
| massive tremolite/actinolite | tr | Tabular layers up to 15 m thick slightly discordant to layering in enclosing rocks; coarse-grained and massive internally, but contacts strongly boudinaged. Contains contact zones up to 30 cm thick consisting of very coarse grained biotite | Not differentiated | Spatially associated with massive sulphides at E Zone and T showing; occurs at several structural levels |

## 2005 AIRBORNE SURVEY AREA:

An airborne electromagnetic and magnetic geophysical survey was performed over the Ruddock Creek Property to help assist in the delineation of massive sulphide bodies. The property contains several mineralized zones including some large occurrences of massive sulphide; poor outcrop exposure and complex geology have made mapping difficult.

The dimensions for the airborne survey of the Ruddock Creek property were $\sim 6.9 \mathrm{~km}$ by 3 km , covering an area of approximately 20.7 square km ( 2072.7 ha ). The main survey comprised 66 north-south lines at 100 m spacing with four east-west tie lines at 1000 m intervals. Flight lines were $\sim 3.0 \mathrm{~km}$ long while eastwest tie lines were 6.9 km , totalling approximately 225.87 km . The boundary of the survey area is defined by the following UTM coordinates (NAD 83, Zone 11):

Northern Limit: 5739250 N
Southern Limit: 5736250 N
Eastern Limit: 370000 E
Western Limit: 363500 E

## GEOPHYSICAL SURVEY:

The airbornesurvey was conducted by Aeroquest Limited of Milton, ON, from May 10-11, 2005. Some data processing occurred on site, but final data compilation continued in the office following cessation of the field program. The technical report with the results of the survey is appended in Section D.

## CONCLUSIONS:

Interpretation of data from the EM survey identified several large clusters of thick conductors that form elongate bodies similar to the results from the AeroTEM Off-Time Zi colour grid. Areas of strong conductance occur at or near known mineral showings with additional linear conductors trending away. This may assist mapping of mineralized bodies in areas of poor exposure plus establish additional drill targets.

Interpretation of data from the airborne magnetic and EM geophysical survey have demonstrated a good correlation with known mineral occurrences and identified several new areas of interest on the Ruddock Creek property. The E zone, an excellent prospect that has been defined with mapping and drilling, shows up as a large, strong magnetic anomaly with a good grouping of linear conductors. The magnetic intensity drops off sharply to the west, which may locate the E-fault. Other known showings also correlate well with anomalies interpreted from the geophysics.

Large bodies on the east side that coincide with mineral showings trend to the southwest and are up to 400 m wide. Another linear body starts in the central portion as several small magnetic highs and EM conductors near the T showing, trends to the west-northwest as elongate blobs, and ends near the bottom of Oliver Creek as another large magnetic high. Oliver Creek could potentially be a fold hinge as the body is fairly wide, and appears to have two lobes that may represent fold limbs. There are several other isolated to slightly elongate anomalies in the valiey bottom near Oliver Creek; these may be investigated through mapping and trenching.

The anomalies interpreted by geophysics have a large lateral extent and are on trend with mineralized sulphide horizons observed in previous mapping and drilling. These areas are highly prospective as new mineral showings and should be part of any future geological investigation in the Ruddock Creek area.

## RECOMMENDATIONS:

While each phase of exploration and development on the Ruddock Creek property will be dependent on the result of the previous phase, it is now clear that the Property has the potential of hosting a significant deposit of massive sulphides containing economic zinc, lead, and silver. Therefore, the following recommendations are only a guide and will have to be amended as new data becomes available.

Follow-up work is recommended to further explore and define the anomalies interpreted in the airborne magnetic and EM geophysical survey through an investigated further involving trenching, geologic mapping, and/or diamond drilling being effective exploration methods.

First, trenching should be done near Oliver Creek as a large magnetic and EM anomaly is interpreted from the airborne geophysics. The ground in this area is fairly flat so trenching could provide an economical way to test a large area of ground. Mapping should be done concurrent with trenching to record observation such as lithologies, orientation of layering, plus extent of mineralization. This can then be used to help establish the geometry of mineralization in this area to assist in defining drill targets. Outcrop has been observed at surface in previous mapping, and there are also some anomalies in this area interpreted from a ground based UTEM survey, making this area highly prospective.

Second, mapping should be an important component of any exploration program in the area and an integral part of trenching and drilling. Several maps have been produced for the area but all at different scales, and often only covering small portions of the property. The main goal of any mapping program should be a comprehensive study, including a detailed literature compilation, for the property area. Part of this should also include a geometric analysis and 3D structural interpretation to assist in drill hole planning; orientation of structural fabrics may change across the property so this could prove useful when planning drill holes.

Last, a diamond drill program should be included as part of an exploration program, comprised of three parts, including: Oliver Creek, E Zone including the deep zone, and property reconnaissance. Recent data suggest Oliver Creek has good potential to host a sizeable ore body. The results from trenching can be combined with the geophysical data and mapping to plan drill targets in the area to extend the zone with the purpose of defining a new massive sulphide zone. Of particular importance is the possibility of a fold hinge in the northwest part of the survey area, adjacent to geophysical anomalies. Massive sulphide boulders and subcrop are observed near surface in some areas so several shallow holes may determine the extent of a mineralized deposit.

The main focus of any drill program should be the E Zone as this area is at the most advanced stage of exploration and is close to a measured mineral resource. Drilling in the E Zone should include the main E Zone with the goal of defining a measured resource, plus determining the resource potential of the deeper mineralization, offset 300 m from the main E Zzone by a fault. The deep mineralization requires long drill holes, so several well-spaced holes should be completed to determine the extent of the massive
sulphide body in preparation for defining a resource. If results from surface drilling are favourable, construction of an adit for underground drilling may prove effective.

Several additional showings on the property indicate good potential to host additional massive sulphide deposits and can form part of a property-wide reconnaissance drill program. Exploration has identified more than ten mineralized showings on the Ruddock Creek property and defined a massive sulphide horizon up to 5 km long that can be traced or inferred for up to 13 km . Most occurrences are metre-scale layers of massive sulphide, but are structurally thickened in the hinge zone of folds. The tight folding and repetition of layers yields good potential for additional resources from some of these zones with drilling necessary to determine the depth and volume of mineralization. Drill targets can be determined through interpretation of previous data, including drilling, plus concurrent mapping.

## Sespectfully submitted,



## REFERENCES:

Brown, D.H., Fraser, D. (1973): Report on Airborne Geophysical Survey - Top, In and Light Groups; by authors for Wesfrob Mines Ltd., B.C. Assessment Report \#04567.

Fyles, J.T., (1970): The Jordan River Area near Revelstoke British Columbia; A preliminary study of lead zinc deposits in the Shuswap Metamorphic Complex; B.C. Department of Mines and Petroleum Resources, Bulletin 57.

Gray, P.D., Lewis, P.D. (2001): Geological Assessment Report on the Ruddock Creek; by authors for Doublestar Resources Ltd., B.C. Assessment Report \#26487.

Hodgson, G.D. (1976): Diamond Drilling Report on the IT 27 Claim (Ruddock Creek Area); by author for Cominco Ltd., B.C. Assessment Report \#05990.

Lajoie, J.J. (1982): Geophysical Report on the Borehole Pulse EM, UTEM and VLF Electromagnetic Surveys and Magnetometer Survey on the Ruddock Creek Property; by author for Cominco Ltd., B.C. Assessment Report \#10710.

Lewis, P.D. (2000): Structural Analysis of the Ruddock Creek $\mathrm{Zn}+\mathrm{Pb}$ Property; consulting report prepared for Doublestar Resources Ltd., December 6, 2000.

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Mawer, A.B., (1976): Ruddock Creek Termination Report 1976; Internal document prepared by Cominco Exploration Ltd., November 30, 1976.

Miller-Tait, J., (2005): Diamond Drilling Report on the Ruddock Creek Property, IT 2 Mineral Claim, for Cross Lake Minerals Lid., February 24, 2005; B.C. Assessment Report \#27654

Miller-Tait, J., (2006): Diamond Drilling Report on the Ruddock Creek Property, Tenure \#516624, for Selkirk Metals Holdings Corp., May 12, 2006; B.C. Assessment Report \# $\qquad$

Morris, H.R., (1965): Report on Ruddock Creek Lead-Zinc Property, 1961 to 1963; Internal report prepared for Falconbridge Nickel Mines Ltd., March 12, 1965.

Nichols, R. (1977): Diamond Drilling Report on the IT Group, by author for Cominco Ltd., B.C. Assessment Report \#06625.

Paterson, D.M. (1975): Diamond Drilling Report on the IT 4 (Ruddock Creek Group); by author for Cominco Ltd., B.C. Assessment Report \#05625.

## STATEMENT OF OUALIFICATIONS:

For: Jim Miller-Tait of 828 Whitchurch Street, North Vancouver, B.C. V7L 2A4

I graduated from the University of British Columbia with a Bachelor of Sciences Degree in Geology (1987);

I have been practicing my profession as a geologist in mineral exploration and mining continuously since 1987;

I am a fellow in good standing with the Geological Association of Canada;

I am a registered member in good standing as a Professional Geoscientist with the Association of Professional Engineers and Geoscientists of British Columbia;

The observations, conclusions and recommendations contained in the report are based on field examinations, personal surveying and the evaluation of results of the exploration program completed by the operator of the property.


SECTION B: PROPERTY

| RUDDOCK CREEK |  |  | SCHEDULE OF MINERAL CLAIM |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PROVINCE: British Columbia |  |  | CLAIMS: 7 \| CELLS: 187 |  | AREA: 3739.059 ha |  |
| MINING DIVISION: Kamloops, Revelstoke |  |  | NTS: 82M/14E, 15W |  | BCGS: 082M.075, 076, 085 |  |
| LOCATION: 100 km NNW of Revelstoke, 28 km east of Avola and 6.5 km west of Gordon Horne Peak. |  |  | LATITUDE: $51^{\circ} 46.5^{\prime}$ |  | LONGITUDE: $118{ }^{\circ} 55^{\prime}$ |  |
|  |  |  | UTM: NAD 83 | Zone 11 | 5738000 N | 368 000 |
|  |  |  | PROPERTY INTEREST: <br> Doublestar Resources Ltd. - 100\% <br> Selkirk Metals Holdings Corp. - 0\% <br> Teck Cominco Limited - 1\% Net Smelter Return |  |  |  |
| MAP | $\begin{aligned} & 1: 250000 \\ & 1: 50000 \\ & 1: 50000 \\ & 1: 20000 \\ & 1: 20000 \\ & \hline \end{aligned}$ | 82M Seymour Arm <br> 82M/14 Messiter <br> 82M/15 Scrip Creek <br> 82M.075 Camp Six Creek <br> 82M.076 Gordon Horne Peak |  |  |  |  |
| AGREEMENT SUMMARY: |  |  |  |  |  |  |
| March 23, 2004: Letter Option Agreement between Doublestar Resources Ltd. and Cross Lake Minerals Ltd. |  |  |  |  |  |  |
| June 10, 2004: Formal Option and Joint Venture Agreement between Doublestar Resources Led. and Cross Lake Minerals Ltd. whereby Cross Lake may eam a $60 \%$ interest by cash payments of $\$ 10,000$, by issuing 900,000 shares and by incurring aggregate exploration expenditures of $\$ 3,000,000$ by Dec 2007 ; an additional $10 \%$ interest may be earned by incurring additional exploration expenditures of $\$ 1,750,000$. |  |  |  |  |  |  |
| May 16, 2005: Notice from Cross Lake to Doublestar of intention to assign interest to Selkirk Metals Holdings Corp. Amendment to paragraph 2.02 (c) adjusting the oustanding number of shares remaining to be issued, 200,000 shares of Selkirk Metats Corp. instead of 500,000 shares of Cross Lake. |  |  |  |  |  |  |
| June 16, 2005: Assignment Agreement between Cross Lake Minerals Ltd. and Selkirk Metals Holdings Corp. whereby Cross Lake assigned all its rights, interests and obligations in the Ruddock Creek Agreement to Selkirk Holdings. |  |  |  |  |  |  |


| CLAIM SUMMARY: |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { CLAIM } \\ & \text { NAME } \end{aligned}$ | TENURE NUMBER | $\begin{aligned} & \text { CELLS/ } \\ & \text { UNITS } \end{aligned}$ | $\begin{aligned} & \hline \text { GROSS } \\ & \text { AREA } \\ & \text { (hectares) } \end{aligned}$ | $\begin{aligned} & \text { RECORD } \\ & \text { DATE } \\ & \text { (yyy-mm-dd) } \end{aligned}$ | $\begin{aligned} & \text { GOODTO } \\ & \text { DATE } \\ & \text { (yyyy-mm-dd) } \end{aligned}$ | ANNUAL WORK \$ | RECORDED OWNER <br> /REMARKS |
| Kamloops Mining Division: |  |  |  |  |  |  |  |
| Cell Claims: |  | Cells |  |  |  |  |  |
| OLIVER | 516176 | 25 | 499.901 | 2005-07-06 | 2012-12-01 | 3999.21 | Selkirk Metals Holdings Corp. |
| - | 516624 | 79 | 1579.800 | 2005-07-10 | 2013-12-01 | 12638.40 | Selkirk Metals Holdings Corp. |
| RC 2 | 518989 | 1 | 20.001 | 2005-08-12 | 2012-12-01 | 160.01 | Selkirk Metals Holdings Corp. |
| RC 3 | 531888 | 20 | 399.925 | 2006-04-12 | 2007-04-12 | 1599.70 | Selkirk Metals Holdings Corp. |
| RC 4 | 531890 | 22 | 439.759 | 2006-04-12 | 2007-04-12 | 1759.04 | Selkirk Metals Holdings Corp. |
| RC5 | 531893 | 16 | 319.940 | 2006-04-12 | 2007-04-12 | 1279.76 | Selkirk Metais Holdings Corp. |
| RC 6 | 531894 | 24 | 479.733 | 2006-04-12 | 2007-04-12 | 1918.93 | Selkirk Metals Holdings Corp. |
| 7 |  | 187 | 3739.059 |  |  | \$23355.05 |  |


| CLAIM BOUNDARY COORDINATES |  | UTM: NAD 83, ZONE 11 |  |  |
| :---: | :---: | :---: | :---: | :---: |
| MAIN BLOCK |  |  |  |  |
| Corner No. | Cell ID | Cell Corner | Easting | Northing |
| 1 | $082 \mathrm{M15D} 042 \mathrm{C}$ | NE | 369315.428 | 5739561.703 |
| 2 | 082 M 15 D 032 A | NW | 369279.331 | 5738171.620 |
| 3 | 082MI5D032A | NE | 369710.459 | 5738160.421 |


| Corner No. | Cell ID | Cell Corner | Easting | Northing |
| :---: | :---: | :---: | :---: | :---: |
| 4 | 082M15D022D | SE | 369686.477 | 5737233.699 |
| 5 | 082M15D022D | Not a corner* | 369 455* | $5737225^{*}$ |
| 6 | 082M15D022D | Not a corner* | 369 495* | 5737 570* |
| 7 | 082M15D023D | Not a corner* | 368 380* | 5737 295* |
| 8 | 082M15D023D | Not a corner** | 368 420* | 5737 045* |
| 9 | 082M15D014D | Not a corner* | 367 720* | $5736720^{*}$ |
| 10 | 082M15D014C | Not a corner* | 367 220* | $5736610^{*}$ |
| 11 | 082M15D024B | Not a corner* | 367 115* | $5736990 *$ |
| 12 | 082M15D025A | Not a corner* | 366 655* | $5736875 *$ |
| 13 | 082M15D025A | NW | 366668.019 | 5737312.766 |
| 14 | 082M15D028D | SW | 364080.768 | 5737381.962 |
| 15 | 082M15D028D | NW | 364093.278 | 5737845.315 |
| 16 | 082M14A036A | SW | 357194.618 | 5738036.323 |
| 17 | 082M14A066D | NW | 357299.838 | 5741743.104 |
| 18 | 082M14A061D | NE | 362039.152 | 5741610.790 |
| 19 | 082M15D060C | NW | 362013.721 | 5740684.084 |
| 20 | 082M15D060C | NE | 362444.647 | 5740672.297 |
| 21 | 082M15D060B | SE | 362419.299 | 5739745.591 |
| 22 | 082M15D056A | SW | 365867.359 | 5739652.463 |
| 23 | 082M15D056A | NW | 365879.713 | 5740115.821 |
| 24 | 082M15D055B | NE | 366744.652 | 5740092.910 |
| 25 | 082M15D055B | SE | 366729.378 | 5739629.551 |
| 26 | 082M15D054B | SW | 367160.387 | 5739618.132 |
| 27 | 082M15D054B | NW | 367172.622 | 5740081.491 |
| 28 | 082M15D053B | NE | 368465.527 | 5740047.532 |
| 29 | 082M15D053B | SE | 368453.413 | 5739584.171 |
| SE PARCEL |  |  |  |  |
| A | 082M15D022C | Not a corner* | 369 250* | 5737 385* |
| B | 082M15D022A | Not a corner* | 369 420* | $5736970^{*}$ |
| C | 082M15D013A | Not a corner* | 368 630* | $5736640^{*}$ |
| D | 082M15D023D | Not a corner* | 368 460* | 5737 070* |

Note: Property corners are numbered in a sequence starting at the NE corner of the property and proceeding in a clockwise direction.

* These points are not computed MTO cell corners and the coordinate values have been scaled from 1:20 000 claim
and topographic maps.
ASSESSMENT WORK SUMMARY:

| ASSESSMENT WORK SUMARY: |  |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Date of Filing <br> (yyyy-mm-dd) | Work <br> Filed <br> $\$$ | New Work <br> Applied <br> $\$$ | PAC <br> Credits <br> Applied | PAC <br> Credits <br> Saved | Total <br> PAC <br> Credits | Date of <br> Approval <br> (yyyy-mm-dd) | Event <br> Number |
| $2004-10-20$ | Notice to Group: 62 claims |  |  |  |  |  |  |
| $2004-10-20$ | 375412.22 | 77000 |  | - | 298412.22 |  | $2004-10-20$ |
| $2006-02-24$ | 600000.00 | 58371.18 | - | 541628.82 |  | $2005-07-18$ | 3218721 |
| $2006-05-11$ | 41000.00 | 12638.40 |  | 28361.60 |  |  | 4071828 |

## CLAIM CONVERSION SUMMARY:

| CLAIM <br> NAME | TENURE <br> NUMBER | CELLS/ <br> UNITS | GROSS <br> AREA <br> (hectares) | RECORD <br> DATE <br> (yyyy-mm-dd) | GOOD TO <br> DATE <br> (yyyy-mm-dd) | ANNUAL <br> WORK <br> \$ | RECORDED OWNER <br> /REMARKS |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Kamloops Mining Division: |  |  |  |  |  |  |  |
| Legacy Claims: | Units |  |  |  |  |  |  |
| IF 4 | 216759 | 10 | 250.000 | $1977-06-30$ | $2009-11-29$ | 2000.00 | Converted to Tenure No. <br> 516624 on 2005-07-10 |


| $\begin{aligned} & \text { CLAIM } \\ & \text { NAME } \end{aligned}$ | TENURE NUMBER | $\begin{aligned} & \text { CELLS } \\ & \text { or } \\ & \text { UNITS } \end{aligned}$ | GROSS AREA (hectares) | $\begin{gathered} \text { RECORD } \\ \text { DATE } \\ \text { (yyy-mm-dd) } \end{gathered}$ | $\begin{aligned} & \text { GODTO } \\ & \text { (yyyy-mm-dd) } \end{aligned}$ | ANNUAL WORK | RECORDED HOLDER |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| IF 5 | 216760 | 5 | 125.000 | 1977-06-30 | 2009-11-29 | 1000.00 | Converted to 516624 |
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| IT 59 | 220078 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT I | 220344 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
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| IT 6 | 220349 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 7 | 220350 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 8 | 220351 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 9 | 220352 | I | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
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| IT 39 | 220364 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
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| IT 42 | 220367 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
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| IN 6 | 220412 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 7 | 220413 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 8 | 220414 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 9 | 220415 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 10 | 220416 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 11 | 220417 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 12 | 220418 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 13 | 220419 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 14 | 220420 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 15 | 220421 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 16 | 220422 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 17 | 220423 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 18 | 220424 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IN 19 | 220425 | 1 | 20.903 | 1961-07-19 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 83 | 220432 | 1 | 20.903 | 1961-08-29 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 84 | 220433 | 1 | 20.903 | 1961-08-29 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 85 | 220434 | 1 | 20.903 | 1961-08-29 | 2009-11-29 | 200.00 | Converted to 516624 |
| TO 9 | 220539 | 1 | 20.903 | 1962-09-10 | 2009-11-29 | 200.00 | Converted to 516624 |
| TO 10 | 220540 | 1 | 20.903 | 1962-09-10 | 2009-11-29 | 200.00 | Converted to 516624 |
| TO 11 | 220541 | 1 | 20.903 | 1962-09-10 | 2009-11-29 | 200.00 | Converted to 516624 |


| $\begin{aligned} & \text { CLAIM } \\ & \text { NAME } \end{aligned}$ | $\begin{aligned} & \text { TENURE } \\ & \text { NUMBER } \end{aligned}$ | CELLS or UNITS | GROSS AREA (hectares) | $\begin{aligned} & \text { RECORD } \\ & \text { DATE } \\ & \text { (yyyy-mm-dd) } \end{aligned}$ | $\begin{aligned} & \text { GOOD TO } \\ & \text { DATE } \\ & \text { (yyyy-mm-dd) } \end{aligned}$ | ANNUAL WORK | $\begin{aligned} & \text { RECORDED } \\ & \text { HOLDER } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| TO 12 | 220542 | 1 | 20.903 | 1962-09-10 | 2009-11-29 | 200.00 | Converted to 516624 |
| TO 13 | 220543 | 1 | 20.903 | 1962-09-10 | 2009-11-29 | 200.00 | Converted to 516624 |
| TO 14 | 220544 | I | 20.903 | 1962-09-10 | 2009-11-29 | 200.00 | Converted to 516624 |
| RC 1 | 414133 | 6 | 150.000 | 2004-09-05 | 2009-09-05 | 1200.00 | Abandoned: 2005-08-15 |
| Revelstoke Mining Division: |  |  |  |  |  |  |  |
| IT 27 | 248475 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 28 | 248476 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 29 | 248477 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| IT 30 | 248478 | 1 | 20.903 | 1960-10-07 | 2009-11-29 | 200.00 | Converted to 516624 |
| Cell Claims: |  | Cells |  |  |  |  |  |
| JMT 1 | 502851 | 4 | 79.982 | 2005-01-13 | 2006-01-13 | 319.93 | Cancelled: 2005-04-19 |

SECTION C: EXPENDITURES (Ruddock Creek 2005 Airborne Geophysical Program)

| Item | Work Performed | Quantities /Rates | Amount |
| :--- | :--- | :---: | :---: |
| Project Manager: <br> J. Miller-Tait, P.Geo. <br> Sikanni Mine <br> Development Ltd. | Project planning and supervision, <br> data analysis and report <br> preparation <br> Period: May 2005 to May 2006 | 5 days @ $\$ 450.00$ | $\$ 2,250.00$ |
| Airborne Survey: <br> Aeroquest Limited <br> Milton, ON | Mobilization/Demobilization <br> Airborne survey charges for flying <br> on May 10 and 11, 2005 <br> Total: 225.87 line km |  | $40,718.75$ |
| Total |  |  |  |

Expenditure Apportionment:

| Mineral Tenure | Area Surveyed (hectares) | \% of Total | Expenditure |
| :---: | :---: | :---: | ---: |
| 516176 | 29.72 | 1.43 | $\$ 614.45$ |
| 516624 | 20.00 | 0.97 | 416.80 |
| 518989 | 1160.90 | 56.01 | $24,066.80$ |
| Sub-Total: On Tenure | 1210.62 | 58.41 | $25,098.05$ |
| Off Tenure | 862.08 | 41.59 | $17,870.70$ |
| Total | $\mathbf{2 0 7 2 . 7 0}$ | $\mathbf{1 0 0 . 0}$ | $\$ 42,968.75$ |

## SECTION D: GEOPHYSICAL REPORT

Technical Report on a Helicopter-Borne AeroTEM II Electromagnetic and Magnetic Survey on the Ruddock Creek Property by Aeroquest Limited dated May 2005.

## Report on a Helicopter-Borne AeroTEM® II Electromagnetic \& Magnetometer Survey



Aeroquest Job \# 05012
Ruddock Creek Project
Blue River Area, British Columbia 82M/15
for


## CROSS LAKE Minerals

1255 West Pender Street
Vancouver, B.C.
V6E 2V1
by

## =AEROQUEST LIMITED

4-845 Main Street East
Milton, Ontario, L9T 3Z3
Tel: (905) 693-9129 Fax: (905) 693-9128
www.aeroquestsurveys.com
May, 2005

# Report on a Helicopter-Borne AeroTEM® II Electromagnetic and Magnetic Survey 

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Ruddock Creek Project
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## 1. TABLE OF CONTENTS

1. TABLE OF CONTENTS ..... 1
1.1. List of Figures ..... 1
1.2. Appendices ..... 2
1.3. List of Maps $(1: 10,000)$ ..... 2
2. INTRODUCTION ..... 3
3. SURVEY AREA ..... 3
4. REGIONAL GEOLOGY and EXPLORATION (from Cross Lake Minerals web site) ..... 4
5. SURVEY SPECIFICATIONS AND PROCEDURES ..... 5
6. AIRCRAFT AND EQUIPMENT ..... 7
6.1. Aircraft ..... 7
6.2. Magnetometer ..... 8
6.3. Electromagnetic System ..... 8
6.4. PROTODAS Acquisition System ..... 9
6.5. RMS DGR-33 Acquisition System ..... 10
6.6. Magnetometer Base Station ..... 10
6.7. Radar Altimeter ..... 10
6.8. Video Tracking and Recording System ..... 10
6.9. GPS Navigation System ..... 10
6.10. Digital Acquisition System ..... 11
7. PERSONNEL ..... 12
8. DELIVERABLES ..... 12
9. DATA PROCESSING AND PRESENTATION ..... 12
9.1. Base Map ..... 12
9.2. Flight Path \& Terrain Clearance ..... 13
9.3. Electromagnetic Data ..... 13
9.4. Magnetic Data ..... 14
10. Results and Interpretation ..... 15
10.1. Magnetic Response ..... 15
10.2. EM Anomalies - General comments ..... 16
1.1. List of Figures
Figure 1. Flight line plan, and regional location map of the project area ..... 4
Figure 2. Plan view of E-zone ..... 5
Figure 3. The magnetometer bird (A) and AeroTEM II EM bird (B) ..... 7
Figure 4. Schematic of Transmitter and Receiver waveforms ..... 8
Figure 5. The AeroTEM II Instrument Rack ..... 11
Figure 6. AeroTEM classified anomaly symbols ..... 14
Figure 7. TMI colour map overlain on 1VD shaded map ..... 15
Figure 8. AeroTEM response to a 'thin' vertical conductor ..... 16
Figure 9. AeroTEM response for a 'thick' vertical conductor. ..... 17
Figure 10. AeroTEM response over a 'thick' dipping conductor. ..... 17

### 1.2. Appendices

Appendix 1: Survey Block Co-ordinates
Appendix 2: Description of Database Fields
Appendix 3: Technical Paper: "Mineral Exploration with the AeroTEM System"
Appendix 4: Instrumentation Specification Sheet

### 1.3. List of Maps $(\mathbf{1 : 1 0 , 0 0 0 )}$

Map 1: Coloured Total Magnetic Intensity (TMI) with line contours and EM anomalies
Map 2: Coloured First Vertical Derivative of the TMI with line contours and EM anomalies
Map 3: AeroTEM Off-Time Z1 colour grid with line contours and EM anomalies
Map 4: AeroTEM Off-Time Profiles (Z5-Z15) and EM anomalies

## 2. INTRODUCTION

This report describes a helicopter-borne geophysical survey carried out on behalf of Cross Lake Minerals Ltd. on the Ruddock Creek Project, in the Blue River area, British Columbia. The principal geophysical sensor is Aeroquest's exclusive AeroTEM© II time domain helicopter electromagnetic system which is employed in conjunction with a high-sensitivity cesium vapour magnetometer. Ancillary equipment includes a real-time differential GPS navigation system, radar altimeter, video recorder, and a base station magnetometer. Full-waveform streaming EM data is recorded at 38,400 samples per second. The streaming data comprise the transmitted waveform, and the X component and Z component of the resultant field at the receivers. A secondary acquisition system (RMS) records the ancillary data.

The total line kilometres flown is totaled at 238.5 km . The survey flying described in this report took place on May $10^{\text {th }}$ and May $11^{\text {th }}, 2005$.

Bedrock EM anomalies were auto-picked from the Z-component on-time data and graded according to the 'off-time' conductance. These anomalies were then review by hand and classified for presentation on the maps. This report describes the survey logistics, the data processing, presentation, and provides a brief interpretation of the results.

## 3. SURVEY AREA

The Ruddock Creek Property (Figure 1) is located 100 km north of Revelstoke in the Kamloops and Revelstoke Mining Divisions. The Property consists of 61 claims totalling 74 units, covering an area of 1,850 hectares. The surveying conducted consisted of a single rectangular survey block ( $\sim 6.5 \times 3$ km ) over mountainous terrain (Figure 1). Access to the property was by helicopter. The helicopter was provided by HiWood helicopters, Calgary, Alberta. The field crew were based at the Glacier Mountain Lodge, located in the Blue River Area, British Columbia. The Cross Lake Minerals Ltd. Mineral Dispositions for the area may be located on NTS 1:50,000 map sheet 82M/15.


Figure 1. Flight line plan, and regional location map of the project area

## 4. REGIONAL GEOLOGY and EXPLORATION (from Cross Lake Minerals web site)

The Ruddock Creek property was originally explored by Falconbridge Ltd. Between 1960 to 1975 when a joint venture was formed with Cominco to continue exploration. Exploration programs to date include 9,317 metres of diamond drilling, aeromagnetic surveys, structural studies and limited surface and borehole geophysical surveys. The mineralization is a "Broken-Hill type" zinc-lead-silver sedimentary exhalative consisting of sphalerite, pyrrhotite, galena, pyrite and chalcopyrite hosted within siliceous calc-silicate and quartzite.

There are nine areas of mineralization identified on the Property to date, including the E, F, G, M, T, $\mathrm{U}, \mathrm{V}, \mathrm{R}$ and Q Zones. The E Zone has been the main focus of exploration. The E Zone (Figure 2), a westerly plunging isoclinal antiform, has been delineated by 34 drill holes for a length of approximately 200 metres. The mineralization is offset to the west by a shallow, westerly dipping normal fault that displaces the western section lower by approximately 300 metres. This faulted extension of the E Zone is interpreted to be confirmed by the 1975 drill hole C-75-1 that intersected
$7.68 \%$ zinc and $1.53 \%$ lead over 18.9 feet. Borehole EM surveying of C-75-1 completed in 1982 confirmed a flat conductive sheet that indicates that the intersected mineralization should extend beyond this discovery hole.

## RUDDOCK CREEK PROPERTY <br> Plan View of E-Zone with 2004 Drill Holes



Figure 2. Plan view of E-zone which is the main focus of exploration. (taken from Cross Lake Minerals Website).

## 5. SURVEY SPECIFICATIONS AND PROCEDURES

The survey specifications are summarised in the following table:

| Project Name | Line <br> Spacing <br> $(\mathbf{m})$ | Line direction | Survey Coverage <br> (line-km) | Dates Flown |
| :---: | :---: | :---: | :---: | :---: |
| Ruddock <br> Creek | 100 | $\mathrm{~N}-\mathrm{S}\left(000^{\circ}\right)$ | 238.5 | May10th and $11^{\text {th }}, 2005$ |

The survey coverage was calculated by adding up the along-line distance of the survey lines and control (tie) lines in the final Geosoft database. The database was windowed to the survey block
outline prior to this calculation. The survey was flown with a line spacing of 100 m . The control (tie) lines were flown perpendicular to the survey lines with a spacing of 1 km .
The nominal EM bird terrain clearance is 30 m ( 98 ft ), but can be higher in more rugged terrain. The magnetometer sensor is mounted in a smaller bird connected to the tow rope 21 metres above the EM bird and 17 metres below the helicopter (Figure 3). Nominal survey speed over relatively flat terrain is $75 \mathrm{~km} / \mathrm{hr}$ and is generally lower in rougher terrain. Scan rates for ancillary data acquisition is 0.1 second for the magnetometer and altimeter, and 0.2 second for the GPS determined position. The EM data is acquired as a data stream at a sampling rate of 38,400 samples per second and is processed to generate final data at 10 samples per second. The 10 samples per second translates to a geophysical reading about every 1.5 to 2.5 metres along the flight path.

Navigation is carried out using a GPS receiver, an AGNAV2 system for navigation control, and an RMS DGR-33 data acquisition system which records the GPS coordinates. The x-y-z position of the aircraft, as reported by the GPS, is recorded at 0.2 second intervals.

Unlike frequency domain electromagnetic systems, the AeroTEM® II system has negligible drift due to thermal expansion. The system static offset is removed by high altitude zero calibration lines and employing local leveling corrections where necessary.

The operator is responsible for ensuring the instrument is properly warmed up prior to departure and that the instruments are operated properly throughout the flight. The operator maintains a detailed flight log during the survey noting the times of the flight and any unusual geophysical or topographic features.

On return of the pilot and operator to the base usually after each flight, the ProtoDAS streaming EM data and the RMS data are carried on removable hard drives and FlashCards, respectively and transferred to the data processing work station. At the end of each day, the base station magnetometer data on FlashCard is retrieved from the base station unit.

Data verification and quality control includes a comparison of the acquired GPS data with the flight plan; verification and conversion of the RMS data to an ASCII format XYZ data file; verification of the base station magnetometer data and conversion to ASCII format XYZ data; and loading, processing and conversion of the steaming EM data from the removable hard drive. All data is then merged to an ASCII XYZ format file which is then imported to an Oasis database for further QA/QC and for the production of preliminary EM, magnetic contour, and flight path maps.

Survey lines which show excessive deviation from the intended flight path are re-flown. Any line or portion of a line on which the data quality did not meet the contract specification was noted and reflown.

## 6. AIRCRAFT AND EQUIPMENT

### 6.1. Aircraft

A Eurocopter (Aerospatiale) AS350B2 "A-Star" helicopter - registration C-FPTG used as survey platform. The helicopter was owned and operated by HiWood Helicopters, Calgary, Alberta. Installation of the geophysical and ancillary equipment was carried out by AeroQuest Limited in La Ronge and ferried to the survey area. The survey aircraft was flown at a nominal terrain clearance of 220 ft ( 70 m ).


Figure 3. The magnetometer bird (A) and AeroTEM II EM bird (B)

### 6.2. Magnetometer

The AeroQuest airborne survey system employs the Geometrics G-823A cesium vapour magnetometer sensor installed in a two metre towed bird airfoil attached to the main tow line, 17 metres below the helicopter. The sensitivity of the magnetometer is 0.001 nanoTesla at a 0.1 second sampling rate. The nominal ground clearance of the magnetometer bird is 51 metres ( 170 ft .). The magnetic data is recorded at 10 Hz by the RMS DGR- 33 .

### 6.3. Electromagnetic System

The electromagnetic system is an AeroQuest AeroTEM® II time domain towed-bird system. The current AeroTEM ${ }^{\oplus}$ transmitter dipole moment is 38.8 kNIA. The AeroTEM ${ }^{\oplus}$ bird is towed 38 m ( 125 $\mathrm{ft})$ below the helicopter. More technical details of the system may be found in Appendix 4.

The wave-form is triangular with a symmetric transmitter on-time pulse of approximately 1.1 ms and a base frequency of 150 Hz . The current alternates polarity every on-time pulse. During every Tx on-off cycle ( 300 per second), 128 contiguous channels of raw $x$ and $z$ component (and a transmitter current monitor) of the received waveform are measured. Each channel width is 26.06 microseconds starting at the beginning of the transmitter pulse. This 128 channel data is referred to as the raw streaming data.

$\stackrel{1}{\text { Fi }}$
Figure 4. Schematic of Transmitter and Receiver waveforms

### 6.4. PROTODAS Acquisition System

The 128 channels of raw streaming data are recorded by the AERODAS acquisition system onto a removable hard drive. The streaming data are processed post-survey to yield 33 stacked and binned on-time and off-time channels at a 10 Hz sample rate. The timing of the final processed EM channels is described in the following table:

| Channel | Width | Gate | Start( $\mu \mathrm{S}$ ) | Stop( $\mu \mathrm{s}$ ) | $\operatorname{Mid}(\mu s)$ | Width( $\mu \mathrm{s}$ ) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 ON | 1 | 25 | 651.0 | 677.1 | 664.1 | 26.04 |
| 2 ON | 1 | 26 | 677.1 | 703.1 | 690.1 | 26.04 |
| 3 ON | 1 | 27 | 703.1 | 729.2 | 716.1 | 26.04 |
| 4 ON | 1 | 28 | 729.2 | 755.2 | 742.2 | 26.04 |
| 5 ON | 1 | 29 | 755.2 | 781.3 | 768.2 | 26.04 |
| 6 ON | 1 | 30 | 781.3 | 807.3 | 794.3 | 26.04 |
| 7 ON | 1 | 31 | 807.3 | 833.3 | 820.3 | 26.04 |
| 8 ON | 1 | 32 | 833.3 | 859.4 | 846.4 | 26.04 |
| 9 ON | 1 | 33 | 859.4 | 885.4 | 872.4 | 26.04 |
| 10 ON | 1 | 34 | 885.4 | 911.5 | 898.4 | 26.04 |
| 11 ON | 1 | 35 | 911.5 | 937.5 | 924.5 | 26.04 |
| 12 ON | 1 | 36 | 937.5 | 963.5 | 950.5 | 26.04 |
| 13 ON | 1 | 37 | 963.5 | 989.6 | 976.6 | 26.04 |
| 14 ON | 1 | 38 | 989.6 | 1015.6 | 1002.6 | 26.04 |
| 15 ON | 1 | 39 | 1015.6 | 1041.7 | 1028.6 | 26.04 |
| 16 ON | 1 | 40 | 1041.7 | 1067.7 | 1054.7 | 26.04 |
| 0 OFF | 1 | 44 | 1145.8 | 1171.9 | 1158.9 | 26.04 |
| 1 OFF | 1 | 45 | 1171.9 | 1197.9 | 1184.9 | 26.04 |
| 2 OFF | 1 | 46 | 1197.9 | 1224.0 | 1210.9 | 26.04 |
| 3 OFF | 1 | 47 | 1224.0 | 1250.0 | 1237.0 | 26.04 |
| 4 OFF | 1 | 48 | 1250.0 | 1276.0 | 1263.0 | 26.04 |
| 5 OFF | 1 | 49 | 1276.0 | 1302.1 | 1289.1 | 26.04 |
| 6 OFF | 1 | 50 | 1302.1 | 1328.1 | 1315.1 | 26.04 |
| 7 OFF | , | 51 | 1328.1 | 1354.2 | 1341.1 | 26.04 |
| 8 OFF | 1 | 52 | 1354.2 | 1380.2 | 1367.2 | 26.04 |
| 9 OFF | 1 | 53 | 1380.2 | 1406.3 | 1393.2 | 26.04 |
| 10 OFF | 1 | 54 | 1406.3 | 1432.3 | 1419.3 | 26.04 |
| 11 OFF | 1 | 55 | 1432.3 | 1458.3 | 1445.3 | 26.04 |
| 12 OFF | 1 | 56 | 1458.3 | 1484.4 | 1471.4 | 26.04 |
| 13 OFF | 4 | 57 | 1484.4 | 1588.5 | 1536.5 | 104.17 |
| 14 OFF | 8 | 61 | 1588.5 | 1796.9 | 1692.7 | 208.33 |
| 15 OFF | 16 | 69 | 1796.9 | 2213.5 | 2005.2 | 416.67 |
| 16 OFF | 32 | 85 | 2213.5 | 3046.9 | 2630.2 | 833.33 |

### 6.5. RMS DGR-33 Acquisition System

In addition to the magnetics, altimeter and position data, six channels of real time processed off-time EM data in the Z direction and one in the X direction are recorded by the RMS DGR-33 acquisition system at 10 samples per second and plotted real-time on the analogue chart recorder. These channels are derived by a binning, stacking and filtering procedure on the raw streaming data. The primary use of the RMS EM data ( Z 1 to $\mathrm{Z} 6, \mathrm{X} 1$ ) is to provide for real-time QA/QC on board the aircraft.

The channel window timing of the RMS DGR-33 6 channel system is described in the table below.

| RMS Channel | Start time <br> (microsec) | End time <br> (microsec) | Width <br> (microsec) | Streaming <br> Channels | Noise <br> tolerance |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Z1, X1 | 1269.8 | 1322.8 | 52.9 | $48-50$ | 20 ppb |
| Z2 | 1322.8 | 1455.0 | 132.2 | $50-54$ | 20 ppb |
| Z3 | 1428.6 | 1587.3 | 158.7 | $54-59$ | 15 ppb |
| Z4 | 1587.3 | 1746.0 | 158.7 | $60-65$ | 15 ppb |
| Z5 | 1746.0 | 2063.5 | 317.5 | $66-77$ | 10 ppb |
| Z6 | 2063.5 | 2698.4 | 634.9 | $78-101$ | 10 ppb |

### 6.6. Magnetometer Base Station

The base magnetometer was a GEM Systems GSM-19 overhauser magnetometer with a built in GPS receiver and external GPS antenna. Data logging and UTC time syncronistation was carried out within the magnetometer, with the GPS providing the timing signal. The data logging was configured to measure at 1.0 second intervals. Digital recording resolution was 0.001 nT . The sensor was placed on a tripod in an area of low magnetic gradient and free of cultural noise sources. A continuously updated display of the base station values was available for viewing and regularly monitored to ensure acceptable data quality and diurnal variation.

### 6.7. Radar Altimeter

A Terra TRA 3500/TRI-30 radar altimeter is used to record terrain clearance. The antenna was mounted on the outside of the helicopter beneath the cockpit. Therefore, the recorded data reflect the height of the helicopter above the ground. The Terra altimeter has an altitude accuracy of $+/-1.5$ metres.

### 6.8. Video Tracking and Recording System

A high resolution digital colour 8 mm video camera is used to record the helicopter ground flight path along the survey lines. The video is digitally annotated with GPS position and time and can be used to verify ground positioning information and cultural causes of anomalous geophysical responses.

### 6.9. GPS Navigation System

The navigation system consists of an Ag-Nav Incorporated AG-NAV2 GPS navigation system comprising a PC-based acquisition system, navigation software, a deviation indicator in front of the aircraft pilot to direct the flight, a full screen display with controls in front of the operator, a Mid-Tech

RX400p WAAS-enabled GPS receiver mounted on the instrument rack and an antenna mounted on the magnetometer bird. WAAS (Wide Area Augmentation System) consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations, located on the east and west coasts, collect data from the reference stations and create a GPS correction message. This correction accounts for GPS satellite orbit and clock drift plus signal delays caused by the atmosphere and ionosphere. The corrected differential message is then broadcast through one of two geostationary satellites, or satellites with a fixed position over the equator. The corrected position has a published accuracy of under 3 metres. A recent static ground test of the MidTech WAAS GPS yielded a standard deviation in x and y of under 0.6 metres and for z under 1.5 metres over a two-hour period.

Survey co-ordinates are set up prior to the survey and the information is fed into the airborne navigation system. The co-ordinate system employed in the survey design was WGS84 [World] using the UTM zone 10N projection. The real-time differentially corrected GPS positional data was recorded by the RMS DGR-33 in geodetic coordinates (latitude and longitude using WGS84) at 0.2 s intervals.

### 6.10. Digital Acquisition System

The AeroTEM© received waveform (Figure 4) sampled during on and off-time at 128 channels per decay, 300 times per second, was logged by the proprietary AERODAS data acquisition system. The channel sampling commences at the start of the Tx cycle and the width of each channel is 26.04 microseconds. The streaming data was recorded on a removable hard-drive and was later backed-up onto DVD-ROM from the field processing computer.

The RMS Instruments DGR-33A data acquisition system ( was used to collect and record the analogue data stream, i.e. the positional and secondary geophysical data, including processed 6 channel EM, magnetics, radar altimeter, GPS position, and time. The data was recorded on 128 Mb capacity FlashCard. The RMS output was also directed to a thermal chart recorder for on-board real-time QA/QC.


Figure 5. The AeroTEM II Instrument Rack

## 7. PERSONNEL

The following AeroQuest personnel were involved in the project:

- Manager of Operations: Bert Simon
- Field Data Processor: Matt Holden
- Field Operator: Marc Fortier
- Data Interpretation and Reporting: Jonathan Rudd, Matthew Pozza, Marion Bishop

The survey pilot, Paul Kendal was employed directly by the helicopter operator - HiWood Helicopters Ltd.

## 8. DELIVERABLES

The report includes a set of four geophysical maps plotted at a scale of $1: 10,000$.

- Map 1: Coloured Total Magnetic Intensity (TMI) with line contours and EM anomalies
- Map 2: Coloured First Vertical Derivative of the TMI with line contours and EM anomalies
- Map 3: Z1 AeroTEM Off-Time Z1 colour grid with line contours and EM anomalies
- Map 4: AeroTEM Off-Time Profiles (Z5-Z15) and EM anomalies

All the maps show flight path trace, skeletal topography, and conductor picks represented by an anomaly symbol classified according to calculated off-time conductance. The anomaly symbol is accompanied by postings denoting the calculated off-time conductance, a thick or thin classification and an anomaly identifier label. The anomaly symbol legend is given in the margin of the maps. The magnetic field data is presented as superimposed line contours with a minimum contour interval of 1 nT . Bold contour lines are separated by 100 nT .

The geophysical profile data is archived digitally in a Geosoft GDB binary format database. A description of the contents of the individual channels in the database can be found in Appendix 3. A copy of this digital data is archived at the Aeroquest head office in Milton.

## 9. DATA PROCESSING AND PRESENTATION

All in-field and post-field data processing was carried out using Aeroquest proprietary data processing software, and Geosoft Oasis montaj software. Maps were generated using 36-inch wide Hewlett Packard ink-jet plotters.

### 9.1. Base Map

The geophysical maps accompanying this report are based on positioning in the NAD83 datum. The survey geodetic GPS positions have been projected using the Universal Transverse Mercator
projection in Zone 11 north. A summary of the map datum and projection specifications is given following:

- Ellipse: GRS 1980
- Ellipse major axis: 6378137m eccentricity: 0.081819191
- Datum: North American 1983 - Canada Mean
- Datum Shifts (x,y,z) : 0, 0, 0 metres
- Map Projection: Universal Transverse Mercator Zone 11 (Central Meridian $117^{\circ} \mathrm{W}$ )
- Central Scale Factor: 0.9996
- False Easting, Northing: 500,000m, 0m

For reference, the latitude and longitude in NAD83 are also noted on the maps. The skeletal topography was derived from the Federal Government's $1: 50,000$ NTS map series.

### 9.2. Flight Path \& Terrain Clearance

The position of the survey helicopter was directed by use of the Global Positioning System (GPS). Positions were updated five times per second ( 5 Hz ) and expressed as WGS84 latitude and longitude calculated from the raw pseudo range derived from the C/A code signal. The instantaneous GPS flight path, after conversion to UTM co-ordinates, is drawn using linear interpolation between the $\mathrm{x} / \mathrm{y}$ positions. The terrain clearance was maintained with reference to the radar altimeter. The raw Digital Terrain Model (DTM) was derived by taking the GPS survey elevation and subtracting the radar altimeter terrain clearance values. The calculated topography elevation values are relative and are not tied in to surveyed geodetic heights.

Each flight included at least two high elevation 'background' checks. During the high elevation checks, an internal 5 second wide calibration pulse in all EM channels was generated in order to ensure that the gain of the system remained constant and within specifications.

### 9.3. Electromagnetic Data

The raw streaming data, sampled at a rate of $46,080 \mathrm{~Hz}$ ( 256 channels, 180 times per second) was reprocessed using a proprietary software algorithm developed and owned by Aeroquest Limited. Processing involves the compensation of the X and Z component data for the primary field waveform. Coefficients for this compensation for the system transient are determined and applied to the stream data. The stream data are then pre-filtered, stacked, binned to the 33 on and off-time channels and checked for the effectiveness of the compensation and stacking processes. The stacked data is then filtered, leveled and split up into the individual line segments. The filtering of the stacked data is designed to remove or minimize high frequency noise that can not be sourced from the geology. Further base level adjustments may be carried out at this stage.

The final field processing step was to merge the processed EM data with the other data sets into a Geosoft GDB file. The EM fiducial is used to synchronize the two datasets. The processed channels are presented in a Geosoft "array" channel format in the final GDB (Appendix 2) and are labeled in the database as Zon, Zoff, Xon, and Xoff.

Apparent bedrock EM anomalies were interpreted with the aid of an auto-pick from positive peaks and troughs in the on-time Z channel responses correlated with X channel responses. The auto-picked anomalies were reviewed and edited by a geophysicist on a line by line basis to discriminate between bedrock and conductive overburden sources as well as to determine the source type response (thin vs. thick - discussed later). Anomaly picks locations were migrated and removed as required. This process ensures the optimal representation of the conductor centres on the maps.

At each conductor pick, estimates of the on-time and off-time conductance have been generated based on calculation of the decay constant (tau) of the EM decay curves for those data points along the line where the response amplitude is sufficient to yield an acceptable estimate. Only channels that had a minimum response of $15 \mathrm{nT} / \mathrm{s}$ were included in the tau calculation. A minimum of three channels responding above the $15 \mathrm{nT} / \mathrm{s}$ threshold were required to produce an acceptable tau estimate. The tau values were then windowed to exclude any values that had a correlation-coefficient less than $96 \%$. Conductance values (in Siemens) were then directly calculated from tau values at each conductor pick. Each conductor pick was then classified according to a set of seven ranges of calculated off-time conductance values as indicated on the map legends (Figure 6). Each symbol is also given an identification letter label, unique to each flight line. Conductor picks that did not yield an acceptable estimate of off-time conductance were assigned a 'null' conductance value of " 0.01 ", thus plotting as a low conductance source on the maps.


Figure 6. AeroTEM classified anomaly symbols.

### 9.4. Magnetic Data

Prior to any leveling the magnetic data was subjected to a lag correction of -0.1 seconds and a spike removal filter. The filtered aeromagnetic data were then corrected for diurnal variations using the magnetic base station and the intersections of the tie lines. No corrections for the regional reference field (IGRF) were applied. The corrected profile data were interpolated on to a grid using a random grid technique with a grid cell size of 25 metres. The final leveled grid provided the basis for threading the presented contours which have a minimum contour interval of 1 nT .

## 10. Results and Interpretation

The survey was successful in mapping the magnetic and conductive properties of the geology throughout the survey area. The following is a brief summary and interpretation of the results. For a detailed interpretation of the survey data please contact Aeroquest Limited.

### 10.1. Magnetic Response

The magnetic data provide a high resolution map of the distribution of the magnetic mineral content of the survey area. The sources for anomalous magnetic responses are thought to be predominantly magnetite because of the relative abundance and strength of response (high magnetic susceptibility) of magnetite over other magnetic minerals such as pyrrhotite.

The magnetic data have a dynamic range of only 114 nT across the survey block with lows of approximately 56891 nT to highs of up to 57005 nT (Figure 7). This suggests that the bedrock in the area has relatively uniform magnetic mineral content. Most of the broad magnetic highs are interpreted to define intrusive bodies, where the magnetite concentrations are slightly higher than the host rock (Figure 7). Higher frequency magnetic response (such as visible in the 1VD map) identifies subtle linear magnetic lows and sharp contrasts in magnetic lithogies which likely indicate faulting. Faults often appear as lineaments and often have strike length of several kilometers. Offsets in narrow, magnetic stratigraphic trends can also delineate structure. The dominant magnetic trends are westnorthwest and east-northeast, although the subtle magnetic lows generally trending northwest and north-northwest likely resolve the most recent faulting in the survey area. A few trends have been sketched on Figure 7 (over the E-zone area) as an example.


Figure 7. TMI colour map overlain on 1VD shaded map with illumination from the northwest. A few dominant fault trends (black line) are indicated over the "E-Zone" mineralization area which trend northwest and northnorthwest. EM- anomaly symbols are also plotted. For symbol legend refer to Figure 6.

### 10.2. EM Anomalies - General comments

Several low to moderately conductive bedrock sources have been identified on the maps. Figure 7 demonstrates that the majority of bedrock sources in the area correlate spatially with magnetic anomalies defining intrusive bodies.

The EM anomalies on the maps are classified by conductance (as described earlier in the report) and also by the thickness of the source. A thin, vertically orientated source produces a double peak anomaly in the z-component response and a positive to negative crossover in the x -component response (Figure 8). For a vertically orientated thick source (say, greater than 10 m ), the response is a single peak in the z -component response and a negative to positive crossover in the x -component response (Figure 9). Because of these differing responses, the AeroTEM system provides discrimination of thin and thick sources and this distinction is indicated on the EM anomaly symbols ( $\mathrm{N}=$ thin and $\mathrm{K}=$ thick). Where multiple, closely spaced conductive sources occur, or where the source has a shallow dip, it can be difficult to uniquely determine the type (thick vs. thin) of the source


Figure 8. AeroTEM response to a 'thin' vertical conductor.


Figure 9. AeroTEM response for a 'thick' vertical conductor.


Figure 10. AeroTEM response over a 'thick' dipping conductor.
(Figure 10). In these cases both possible source types may be indicated by picking both thick and thin response styles. For shallow dipping conductors the 'thin' pick will be located over the edge of the source, whereas the 'thick' pick will fall over the downdip 'heart' of the anomaly.

All cases should be considered when analyzing the interpreted picks and prioritizing for follow-up. Specific anomalous responses which remain as high priority should be subjected to numerical modeling prior to drill testing to determine the dip, depth and probable geometry of the source.

Respectfully submitted,

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Aeroquest Limited
June, 2005

## APPENDIX 1 - PROJECT CORNER COORDINATES

The Ruddock Creek Project has a boundary which is defined in the following table. All geophysical data presented in this report have been windowed to this outline. Positions are in UTM Zone 11 NAD83.

Easting (m) Northing (m)
363500.05739250 .0
370002.05739250 .0
$370002.0 \quad 5736250.0$
363500.05736250 .0

## APPENDIX 2 - Description of Database Fields

The GDB file is a Geosoft binary database. In the database, the Survey lines and Tie Lines are prefixed with an "L" for "Line" and "T" for "Tie".

Database (05012_final.gdb):

| Column | Units | Description |
| :--- | :--- | :--- |
| emfid |  | AERODAS Fiducial |
| utctime | hh:mm:ss.ss | UTC time |
| X | m | UTM Easting (NAD83, zone 10N) |
| Y | m | UTM Northing (NAD83, zone 10N) |
| Lat_wgs84 | dd.dddddd | Raw WGS84 Latitude |
| Long_wgs84 | dd.dddddd | Raw WGS84 Longitude |
| bheight | m | Terrain clearance of EM bird |
| galtf | m | GPS altitude (WGS 84) |
| dtm | m | Digital Terrain Model |
| magf | nT | Final leveled total magnetic intensity |
| basemagf | nT | Base station total magnetic intensity |
| ZOn | $\mathrm{nT} / \mathrm{s}$ | Processed Streaming On-Time Z component Channels 1-16 |
| ZOff | $\mathrm{nT} / \mathrm{s}$ | Processed Streaming Off-Time Z component Channels 0-16 |
| XOn | $\mathrm{nT} / \mathrm{s}$ | Processed Streaming On-Time X component Channels 1-16 |
| XOff | $\mathrm{nT} / \mathrm{s}$ | Processed Streaming Off-Time X component Channels 0-16 |
| Anom_labels |  | Letter label of conductor pick |
| on_con | S | On-time conductance |
| off_con | S | Off-time conductance |
| grade |  | Classification from 1-7 based on conductance of conductor <br> pick |

# APPENDIX 3: AeroTEM Design Considerations 

## Advantage 1 - Spatial Resolution

Helicopter-borne EM systems offer an advantage that cannot be matched from a fixed-wing platform. The ability to fly depth penetration. advantageonlyhelicopter-borne high-moment time domain EM systems the fixed-wing platforms are losing their especially important in areas of complex geology and in the search for discrete conductors. With the advent of systems provide more detail than any other EM configuration, airborne or ground-based. Spatial resolution is at a slower speed and collect data with high spatial resolution, and with great accuracy, means that helicopter EM -

The AeroTEM system is specifically designed to have a small footprint. This is accomplished through the use of concentric transmitter-receiver coils and a relatively small diameter transmitter coil ( 5 m ). The result is a highly focused exploration footprint, which allows for more accurate "mapping" of discrete conductors. Consider the transmitter primary field images shown in Figure 1, for AeroTEM versus a fixed-wing transmitter. The footprint of AeroTEM at the earth's surface is The footprint of a fixed-wing system is roughly 150 m roughly 50 m on either side of transmitter. on either side of the transmitter.


Figure 1. A comparison of the footprint between AeroTEM and a fixed-wing system, highlights the greater resolution that is achievable with a transmitter located closer to the earth's surface. The AeroTEM footprint is one third that of a fixed-wing system and is symmetric, while the fixed-wing system has even lower spatial resolution along the flight line because of the separated transmitter and receiver configuration.

At first glance one may want to believe that a transmitter footprint that is distributed more evenly over a larger area is of benefit in mineral exploration. In fact, the opposite is true; by energizing a larger surface area, the ability to energize and detect discrete conductors is reduced. Consider, for example, a comparison between AeroTEM and a fixed-wing system over the Mesamax Deposit ( $1,450,000$ tonnes of $2.1 \% \mathrm{Ni}, 2.7 \% \mathrm{Cu}, 5.2 \mathrm{~g} / \mathrm{t} \mathrm{Pt} / \mathrm{Pd}$ ). In a test survey over three flight lines spaced 100 m apart, AeroTEM detected the Deposit on all three flight lines. The fixed-wing system detected the Deposit only on two flight lines. In exploration programs that seek to expand the flight line spacing in an effort to reduce the cost of the airborne survey, discrete conductors such as the Mesamax Deposit can go undetected. The argument often put forward in favor of using fixed-wing systems is that because of their larger footprint, the flight line spacing can indeed be widened. Many fixed-wing surveys are flown at 200 m or 400 m . Much of the survey work performed by Aeroquest has been to survey in areas that were previously flown at these wider line spacings. One of the reasons for AeroTEM's impressive discovery record has been the strategy of flying closely spaced lines and finding all the discrete near-surface conductors. These higher resolution surveys are being flown within existing mining camps, areas that improve the chances of discovery.



Figure 2. Fixed-wing (upper) and AeroTEM (lower) comparison over the eastern limit of the Mesamax Deposit, a Ni-Cu-PGE zone located in the Raglan nickel belt and owned by Canadian Royalties. Both systems detected the Deposit further to the west where it is closer to surface.

The small footprint of AeroTEM combined with the high signal to noise ratio ( $\mathrm{S} / \mathrm{N}$ ) makes the system more suitable to surveying in areas where local infrastructure produces electromagnetic noise, such as power lines and railways. In 2002 Aeroquest flew four exploration properties in the Sudbury Basin that were under option by FNX Mining Company Inc. from Inco Limited. One such property, the Victoria Property, contained three major power line corridors.

The resulting AeroTEM survey identified all the known zones of Ni-Cu-PGE mineralization, and detected a response between two of the major power line corridors but in an area of favorable geology. Three boreholes were drilled to test the anomaly, and all three intersected sulphide. The third borehole encountered $1.3 \% \mathrm{Ni}, 6.7 \% \mathrm{Cu}$, and $13.3 \mathrm{~g} / \mathrm{t}$ TPMs over 42.3 ft . The mineralization was subsequently named the Powerline Deposit.

The success of AeroTEM in Sudbury highlights the advantage of having a system with a small footprint, but also one with a high $\mathrm{S} / \mathrm{N}$. This latter advantage is achieved through a combination of a high-moment (high signal) transmitter and a rigid geometry (low noise). Figure 3 shows the Powerline Deposit response and the response from the power line corridor at full scale. The width of power line response is less than 75 m .


Figure 3. The Powerline Deposit is located between two major power line corridors, which make EM surveying problematic. Despite the strong response from the power line, the anomaly from the Deposit is clearly detected. Note the thin formational conductor located to the south. The only way to distinguish this response from that of two closely spaced conductors is by interpreting the X-axis coil response.

## Advantage 2 - Conductance Discrimination

The AeroTEM system features full waveform recording and as such is able to measure the on-time response due to high conductance targets. Due to the processing method (primary field removal), there is attenuation of the response with increasing conductance, but the AeroTEM on-time measurement is still superior to systems that rely on lower base frequencies to detect high conductance targets, but do not measure in the on-time.

The peak response of a conductive target to an EM system is a function of the target conductance and the EM system base
frequency. For time domain EM systems that measure only in the off-time, there is a drop in the peak response of a target as the base frequency is lowered for all conductance values below the peak system response. For example, the AeroTEM peak response occurs for a 10 S conductor in the early off-time and 100 S in the late off-time for a 150 Hz base frequency. Because base frequency and conductance form a linear relationship when considering the peak response of any EM system, a drop in base frequency of $50 \%$ will double the conductance at which an EM system shows its peak response. If the base frequency were lowered from 150 Hz to 30 Hz there would be a fivefold increase in conductance at which the peak response of an EM occurred.

However, in the search for highly conductive targets, such as pyrrhotite-related Ni-Cu-PGM deposits, a fivefold increase in conductance range is a high price to pay because the signal level to lower conductance targets is reduced by the same factor of five. For this reason, EM systems that operate with low base frequencies are not suitable for general exploration unless the target conductance is more than 100 S , or the target is covered by conductive overburden.

Despite the excellent progress that has been made in modeling software over the past two decades, there has been little work done on determining the optimum form of an EM system for mineral exploration. For example, the optimum configuration in terms of geometry, base frequency and so remain unknown. Many geophysicists would argue that there is no single ideal configuration, and that each system has its advantages and disadvantages. We disagree.

When it comes to detecting and discriminating high-conductance targets, it is necessary to measure the pure inphase response of the target conductor. This measurement requires that the measured primary field from the transmitter be subtracted from the total measured response such that the secondary field from the target conductor can be determined. Because this secondary field is in-phase with the transmitter primary field, it must be made while the transmitter is turned on and the transmitter current is changing. The transmitted primary field is several orders of magnitude larger than the secondary field. AeroTEM uses a bucking coil to reduce the primary field at the receiver coils. The only practical way of removing the primary field is to maintain a rigid geometry between the transmitter, bucking and receiver coils. This is the main design consideration of the AeroTEM airframe and it is the only time domain airborne system to have this configuration.


The off-time AeroTEM response for the 16 channel configuration.


The on-time response assuming 100\% removal of the measured primary field.

Figure 4. The off-time and on-time response nomogram of AeroTEM for a base frequency of 150 Hz . The on-time response is much stronger for higher conductance targets and this is why on-time measurements are more important than lower frequencies when considering high conductance targets in a resistive environment.

## Advantage 3 - Multiple Receiver Coils

## =AEROQUEST LIMITED

AeroTEM employs two receiver coil orientations. The Z-axis coil is oriented parallel to the transmitter coil and both are horizontal to the ground. This is known as a maximum coupled configuration and is optimal for detection. The X-axis coil is oriented at right angles to the transmitter coil and is oriented along the line-of-flight. This is known as a minimum coupled configuration, and provides information on conductor orientation and thickness. These two coil configurations combined provide important information on the position, orientation, depth, and thickness of a conductor that cannot be matched by the traditional geometries of the HEM or fixed-wing systems. The responses are free from a system geometric effect and can be easily compared to model type curves in most cases. In other words, AeroTEM data is very easy to interpret. Consider, for example, the following modeled profile:


Figure 5. Measured (lower) and modeled (upper) AeroTEM responses are compared for a thin steeply dipping conductor. The response is characterized by two peaks in the Z-axis coil, and a cross-over in the $X$-axis coil that is centered between the two Z-axis peaks. The conductor dips toward the higher amplitude Z-axis peak. Using the $X$ axis cross-over is the only way of differentiating the Z-axis response from being two closely spaced conductors.

HEM versus AeroTEM

Traditional helicopter EM systems operate in the frequency domain and benefit from the fact that they use narrowband as opposed to wide-band transmitters. Thus all of the energy from the transmitter is concentrated in a few discrete frequencies. This allows the systems to achieve excellent depth penetration (up to 100 m ) from a transmitter of modest power. The Aeroquest Impulse system is one implementation of this technology.

The AeroTEM system uses a wide-band transmitter and delivers more power over a wide frequency range. This frequency range is then captured into 16 time channels, the early channels containing the high frequency information and the late time channels containing the low frequency information down to the system base frequency. Because frequency domain HEM systems employ two coil configurations (coplanar and coaxial) there are only a maximum of three comparable frequencies per configuration, compared to 16 AeroTEM off-time and 12 AeroTEM on-time channels.

Figure 6 shows a comparison between the Dighem HEM system ( 900 Hz and 7200 Hz coplanar) and AeroTEM (Zaxis) from surveys flown in Raglan, in search of highly conductive Ni-Cu-PGM sulphide. In general, the AeroTEM peaks are sharper and better defined, in part due to the greater S/N ratio of the AeroTEM system over HEM, and also due to the modestly filtered AeroTEM data compared to HEM. The base levels are also better defined in the AeroTEM data. AeroTEM filtering is limited to spike removal and a 5-point smoothing filter. Clients are also given copies of the raw, unfiltered data.


Figure 6. Comparison between Dighem HEM (upper) and AeroTEM (lower) surveys flown in the Raglan area. The AeroTEM responses appear to be more discrete, suggesting that the data is not as heavily filtered as the HEM data. The S/N advantage of AeroTEM over HEM is about 5:1.

Aeroquest Limited is grateful to the following companies for permission to publish some of the data from their respective surveys: Wolfden Resources, FNX Mining Company Inc, Canadian Royalties, Nova West Resources, Aurogin Resources, Spectrem Air. Permission does not imply an endorsement of the AeroTEM system by these companies.

## APPENDIX 4: AeroTEM Instrumentation Specification Sheet

# AEROTEM Helicopter Electromagnetic System 

## System Characteristics

- Transmitter: Triangular Pulse Shape Base Frequency 30 or 150 Hz
- Tx On Time $-5,750(30 \mathrm{~Hz})$ or $1,150(150 \mathrm{~Hz}) \mu \mathrm{s}$
- Tx Off Time - $10,915(30 \mathrm{~Hz})$ or $2,183(150 \mathrm{~Hz}) \mu \mathrm{s}$
- Loop Diameter - 5 m
- Peak Current - 250 A
- Peak Moment - 38,800 NIA
- Typical Z Axis Noise at Survey Speed $=8 \mathrm{ppb}$ peak
- Sling Weight: 270 Kg
- Length of Tow Cable: 40 m
- Bird Survey Height: 30 m or less nominal


## Receiver

- Three Axis Receiver Coils (x, y, z) positioned at centre of transmitter loop
- Selectable Time Delay to start of first channel $21.3,42.7$, or 64.0 ms


## Display \& Acquisition

- PROTODAS Digital recording at 126 samples per decay curve at a maximum of 300 curves per second ( $26.455 \mu \mathrm{~s}$ channel width)
- RMS Channel Widths: 52.9,132.3, 158.7, 158.7, 317.5, $634.9 \mu \mathrm{~s}$
- Recording \& Display Rate $=10$ readings per second.
- On-board display - six channels Z-component and 1 X-component


## System Considerations

Comparing a fixed-wing time domain transmitter with a typical moment of 500,000 NIA flying at an altitude of 120 m with a Helicopter TDEM at 30 m , notwithstanding the substantial moment loss in the airframe of the fixed wing, the same penetration by the lower flying helicopter system would only require a sixty-fourth of the moment. Clearly the AeroTEM system with nearly 40,000 NIA has more than sufficient moment. The airframe of the fixed wing presents a response to the towed bird, which requires dynamic compensation. This problem is non-existent for AeroTEM since transmitter and receiver positions are fixed. The AeroTEM system is completely portable, and can be assembled at the survey site within half a day.

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