TECHNICAL REPORT

ON THE

HAWK PROPERTY

OMINECA MINING DIVISION

NTS: 094C.002
Latitude 56° 02' 33"N Longitude 125° 40' 49.8"W
(UTM NAD 83 333029mE, 6214050mN)

Prepared by:
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Effective Date: August 23rd, 2010

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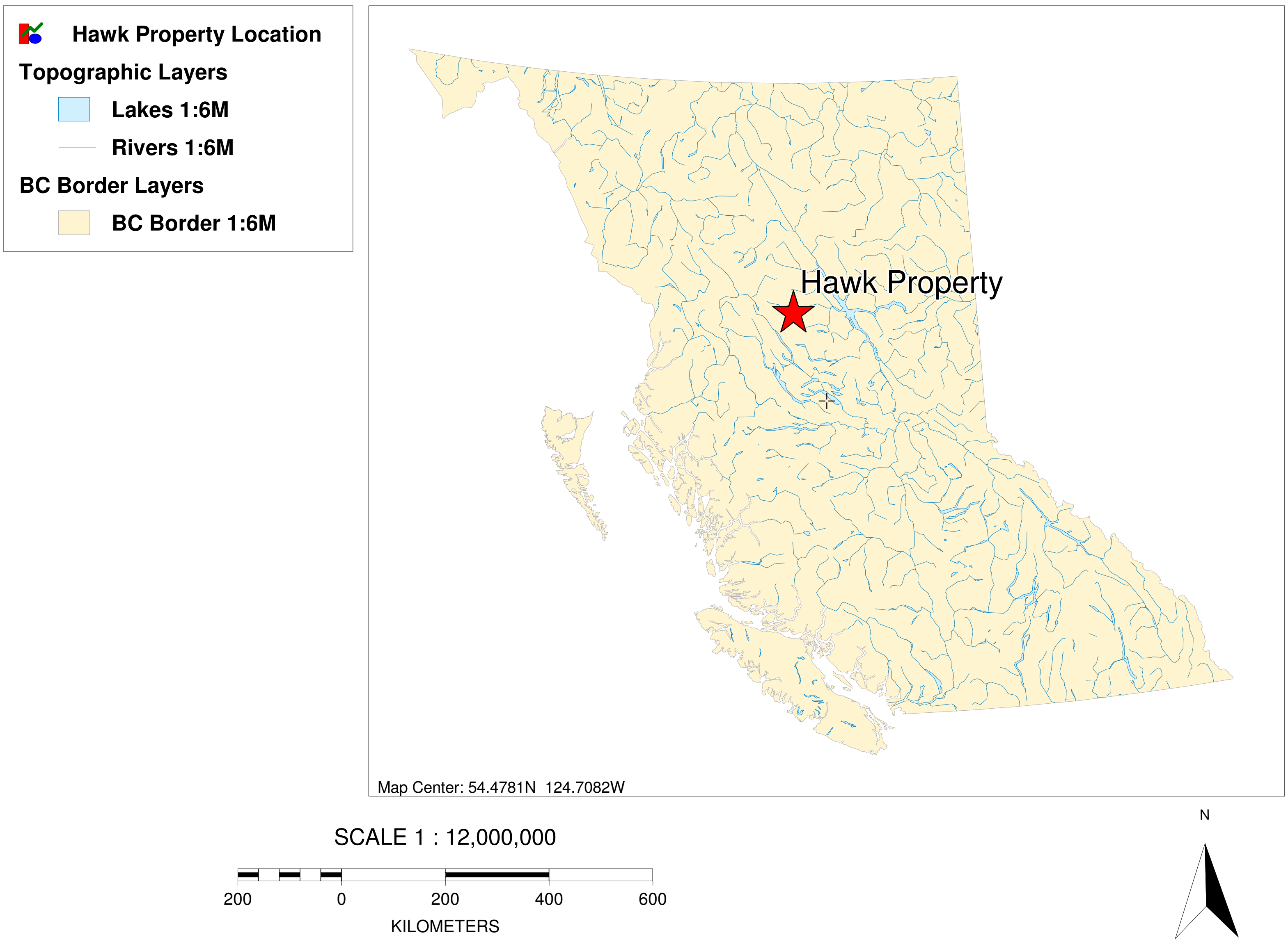
Item 3: Summary

The Hawk property, covering some 3958 contiguous hectares of mineral tenure, is located in the Omineca Mining Division in north central British Columbia, approximately 275 kilometers or 4.5 hours northwest of the town of Mackenzie. From Mackenzie all weather gravel roads and forestry service roads provide good access to the property.

Geologically the property lies in the Hogem Batholith of the Quesnel Terrane, a north/northwesterly trending belt of alkaline and calc-alkaline volcanic rocks, derived sediments, and coeval intrusions. The property overlies a contact between two phases of the Hogem Batholith: the Middle Jurassic Duckling Creek Syenite Complex and the Early Cretaceous Calc-Alkaline Granites. Over the past 40 years numerous operators have held claims over the area, and extensive exploration programs have been conducted due to its potential to host copper and gold mineralization.

In June 2010, R.M. Durfeld visited the Hawk property in order to reorganize and analyze the core acquired during the 1990 (Cyrpus Gold Ltd.) and 2002 (Redcorp Ventures Ltd.) diamond drill programs. This historic core is stored on the property and is accessible by road. The core was examined and portions of the core deemed to be of interest were obtained for further analysis. Samples were cut and sent in for assay, and the resulting values were compared to those obtained in past exploration programs in order to verify the original mineralization values. As predicted, there was both some variability and some reproducibility in the gold grades between historic and recent analysis. Detailed assay results and a comparison between historic and recent core sampling can be found in Appendix i. After analyzing the core, core boxes were organized, stacked, and covered with tarps to prevent further deterioration. Supplemental work included obtaining twenty-two silt samples from streams throughout the property and analyzing each for gold and 32-Element ICP-AES Analysis. Detailed assay results are contained in Appendix i. Additional work included digitizing all historic data and importing into Manifold GIS to create a compilation of all current geochemical data (Figures 4-1 to 3 and 5-1 to 3).

Hawk Property Location Map



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Item 4: Introduction

This report seeks to provide a compilation of some 40 years of geochemical, geophysical, geological, and drilling data done on the Hawk property, and to that end all historic drill data was digitized and compiled into a database. Additionally, the results of the 2010 geochemical silt sampling and core sampling along with ensuing recommendations are presented. The report has been completed in a format consistent with the requirement of National Instrument 43-101, and is based primarily on data from private company reports describing mineral exploration and development in the Hawk region. Items 6 through 11, including but not limited to property description and location, accessibility, history, and all aspects of detailed geology have been obtained from external sources. In particular, the 1991 report for Cyprus Gold Ltd., the 1996 report for Castleford Resources Ltd., and the 2003 report for Redcorp Ventures Ltd. provided much of the information presented in this report. Primary information includes some of the updated data on accessibility and local resources, as well as the 2010 analytical results from historic diamond drill core and 2010 silt samples.

Item 5: Reliance on Other Experts

There were no other experts involved in preparing this report.

Item 6: Property Description and Location

The Hawk property, covering some 3958 hectares of mineral tenure, is located in the Omineca Mining Division approximately 275 kilometres northwest of Mackenzie and 70 kilometres northwest of Germansen Landing. The property is centred at 56° 02' 33" North Latitude and 125° 40' 49.8" West Longitude (Topographic Map 1:20,000 Trim Sheet 094C.002).

The property consists of 10 mineral tenures and is registered 100% to R.M. Durfeld (FMC 107306). The following table lists the detailed tenure information (tenure number, type, claim name, expiry date and area) and the relative claim locations are shown on the Claim Map (Figure 2). The good to date reflects the statement of work filed on June 15th, 2010 (event ID =4690311). This report documents the exploration work filed in this statement.

Tenure Number	Owner	Tenure Type	Tenure Sub Type	Good To Date	Status	Area (ha)
728342	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	741.1
728382	107306 (100%)	Mineral	Claim	2013/Dec/14	GOOD	54.2
728402	107306 (100%)	Mineral	Claim	2013/Dec/14	GOOD	36.2
728422	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	614.3
728442	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	470.2
728463	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	433.8
728482	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	253.2
728502	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	451.8
728522	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	451.6
728542	107306 (100%)	Mineral	Claim	2011/Jun/30	GOOD	451.6
				Total Area (hectare)		**3958.0**

In British Columbia acquisition of Crown mineral rights is governed by the Mineral Tenure Act and administered by the Mineral Titles Branch. Exploration and development required to maintain a mineral claim in British Columbia for 1 year is $4/hectare for the first, second and third anniversary years and $8/hectare for each subsequent year and applicable recording fees.

Hawk Property Claim Map

Mineral Titles Layers

Hawk Property Tenure

All Mineral Tenures

Topographic Layers

Roads 1:20K

Gravel Road

Paved Road

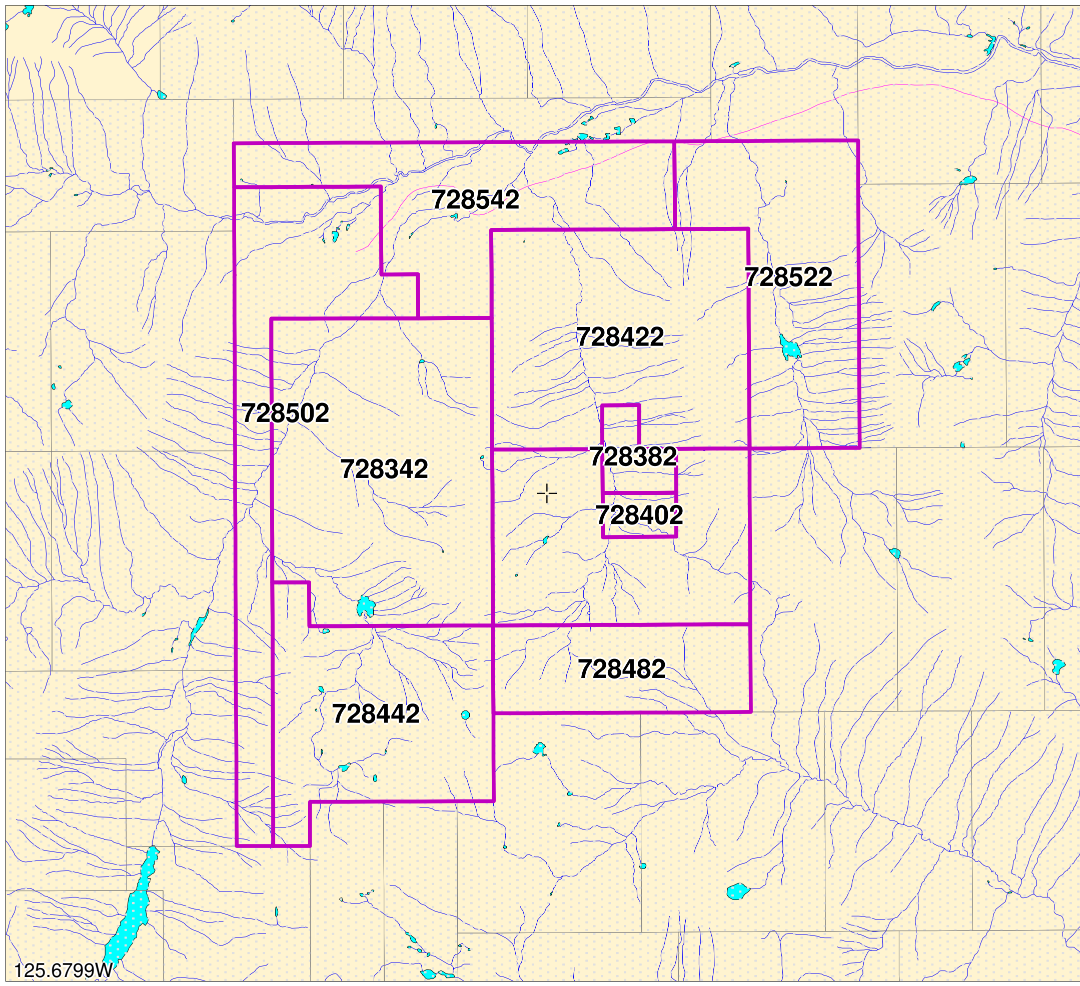
Rough Road

Lakes 1:20K

Rivers 1:20K

BC Border Layers

BC Border 1:50K



SCALE 1 : 80,000

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KILOMETERS

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Item 7: Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Hawk property is located in the Omineca Mountains of north central British Columbia, and can be easily accessed from Mackenzie or Fort St. James by vehicle on all-weather logging roads. Total travel time from either town is approximately 4.5 hours, and numerous logging roads throughout the area facilitate travel.

Mean annual precipitation in the area is roughly 1000 millimetres, and elevations range from 1150 to 2160 metres above sea level. The mean winter temperature ranges from -10°C to -7°C, and the mean summer temperature is approximately 12°C. The snow-free period at lower elevations on the property can extend from April to November but may be as short as July to October, and snow at higher elevations persists much longer into the summer.

The Hawk property is characterized by barren steep slopes at the highest elevations followed by alpine meadows and forested slopes towards the valley bottoms. The Omineca Mountains occur predominantly in the Engelmann Spruce - Subalpine Fir biogeoclimatic zone, and relatively long harsh winters and cool short summers are the norm. Spruce and balsam are common throughout the area, and lodgepole pine occurs at lower elevations. Undergrowth is light to medium, making the forested areas relatively easy to work in. Additionally, numerous cut blocks from previous logging activities occur at lower elevations and greatly improve overall access.

The large area of the property, the well established logging roads, and the close proximity to a water and power supply indicates that the area is well suited for mining activities. The distance to the nearest power line and to suitable haul roads is less than 50 kilometres, and there is abundant area on the property for mine development and waste/tailings disposal. Additionally, there is a large supply of readily available water in the Omineca River, and numerous streams carry water throughout the property. Logging roads in good condition provide access to the property from Mackenzie or Germansen

Landing, and the presence of Kemess mine approximately 130 kilometres to the northwest reaffirms the area as favourable to mining activities.

Item 8: History

Information regarding the history of the property has been derived primarily from the 1996 report by B.D. Game for Castleford Resources Ltd. and the 2003 report by R.G. Carmichael for Redcorp Ventures Ltd.

In the early 1970's numerous mining companies conducted exploration programs in the area of the Hawk property. The Hogem Batholith was of particular interest for porphyry copper-molybdenum deposits, and the first detailed recorded work on the property was conducted in 1971 by Amco Canada. A total of 7376 silt, water, rock, and soil samples were collected throughout 2400 square kilometres, all of which were assayed for copper and molybdenum. The ensuing values showed regions with anomalous copper and/or molybdenum, and lead to the staking of four areas: Tyger, Needle, Oy, and Hawk. Resultant work on each property continued from 1972 to 1974 and included detailed geological mapping and soil sampling. In 1974 Amco Canada conducted a drilling program in which 750 metres of core from four different holes was analyzed for copper. The best hole returned 0.39% copper over 36.2 metres and 0.76% copper over 15.2 metres. After the 1974 drilling program no further work was conducted on the property and the claims were allowed to lapse.

Cyprus restaked three of the four properties, Needle, Oy, and Hawk, and the properties were renamed Steele, Ten, and Hawk respectively. In 1990 Cyprus began an exploration program that involved extensive rock and soil sampling, a magnetic survey, and a VLF survey. The results indicated anomalous values of gold and copper in the Radio vein, AD zone, and HSW regions. Drilling commenced on the AD zone in October of 1990, and a total of 898 metres of core from eight different holes (HK90-1 to HK90-8) was recovered. The following table lists significant gold values obtained for holes one through five, while holes six through eight did not return any significant values.

Hole	Interval (metres)	Width (metres)	Au oz/ton
HK 90-1	57.50-62.65 59.65-61.15	5.15 1.50	0.20 0.58
HK 90-2	64.10-66.90	2.8	0.27
HK 90-3	54.00-54.50	0.5	0.194
HK 90-4	79.00-80.00 100.00-101.35	1.0 1.3	0.86 0.44
HK 90-5	31.55-33.55	2.0	0.128

Cyprus recommended additional work on the Radio vein and HSW area due to the anomalous gold/copper values found in the area, but no more work was conducted by the company and the claims lapsed in 1995. The area was then staked by Nicholson and Associates and R.M. Durfeld, and under the name Castleford Resources Ltd. further work was conducted on the property. Following the work all of the claims except HK3 and HK4 were allowed to lapse, and Redcorp Ventures Ltd. restaked the claims in 2001 and acquired HK3 and HK4 in 2002.

In 2003 Redcorp Ventures Ltd. began a diamond drill program on the Hawk property. A total of 1,534 metres from twelve holes were drilled from the Radio zone (HK02001-HK02005), the AD zone (HK02006-HK02007), and the Zulu zone (HK02008-HK02012). Drill core was logged and based on visible mineralization or alteration sampled (120 in total) and submitted for analysis.

Item 9: Geological Setting

The Hawk property is located in the north-central part of the Quesnel Terrane, a north-northwesterly trending belt of Upper Triassic to Lower Cretaceous arc terrane with both alkaline and calc-alkaline volcanic rocks, derived sediments and coeval intrusions. This belt runs from the Canada-US border to northernmost British Columbia and hosts porphyry copper and/or gold deposits of the alkalic suite (Copper Mountain, Afton, Mount Polley, QR, Mount Milligan, Red Chris and Galore Creek). Features common to alkalic porphyries are an association with regional structures, a relation to alkalic intrusive centres, hydrothermal alteration, mineral zoning and magnetite enrichment. The calc-alkaline suite of rocks host the more molybdenum rich porphyry copper deposits at Highland Valley Copper and Chemess mines.

9.1 Regional and Local Geology

The Hogem Batholith is a northwest elongate composite body 160 kilometres long and up to 35 kilometres wide that intrudes Mesozoic arc-related strata of Quesnellia. Ten kilometres to the west of the property, coincident with the Omenica River, the northwest trending Pinchi fault separates the Quesnellia (Arc) terrain rocks from the oceanic Cache Creek accretionary complex to the southwest.

In the Hawk property area the Hogem Batholith rocks are dominated by the northern end of the Duckling Creek Syenite Complex and the Osilinka Granite Intrusions. The Duckling Creek Syenite is one of several calc-alkalic intrusions that make up the Late Triassic to Early Cretaceous Hogem Batholith. The Duckling Creek Syenite Complex, which measures some 8 kilometres wide and 35 kilometres long, grades into the main batholith in some locations. The rocks are generally coarse-grained, porphyritic syenites composed primarily of pink orthoclase and microcline, along with augite. The green augite is often altered to ragged flakes of brown biotite amid dark green chlorite. In several locations garnets may constitute up to 15% of the rock. Nearly all these syenites are foliated in a north-south direction with a vertical dip.

9.2 Property Geology

The Hawk property covers the east-west trending intrusive contact between the Early Jurassic Duckling Creek Syenite to the south and the Early to Mid Cretaceous Osilinka Granites to the north (Figure 3). The government airborne magnetic surveys map the Osilinka Granites as a magnetic low feature in contrast with the strong magnetic high feature of the Duckling Creek Syenite.

The Duckling Creek Syenite contains numerous rafts of biotite that range from a few metres to several tens of meters wide and are occasionally found with muscovite gneiss. These rocks are often gossanous (limonitic from oxidized biotite) with disseminated

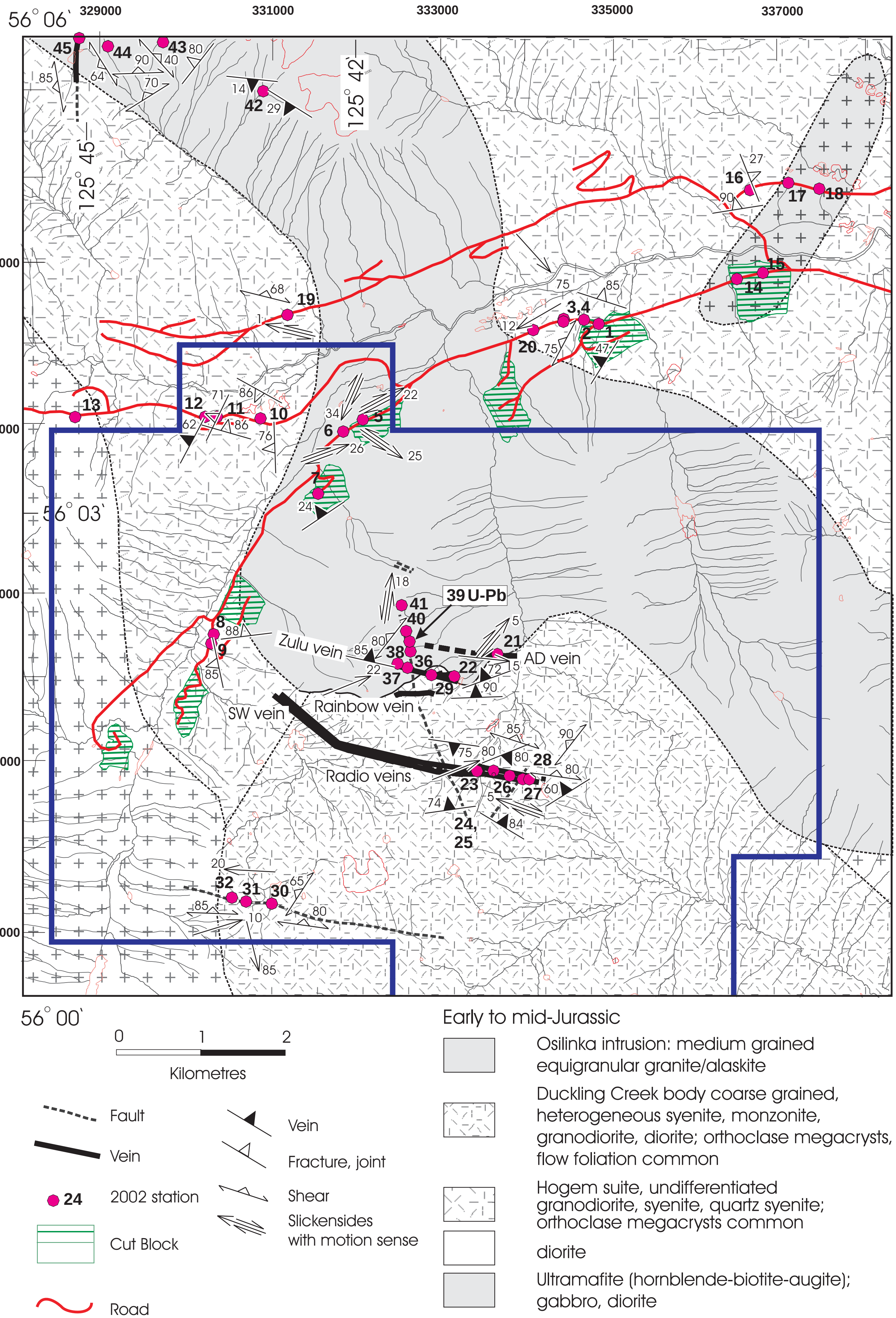


Figure 4: Property Geology (Nelson et.al. 2003)

pyrite and chalcopyrite with minor specularite and malachite. Discontinuous intermediate to mafic dykes or xenoliths composed of andesite, diabase, or fine grained diorite are found most frequently in the leucocratic and mesocratic syenite units but may also occur in the calc-alkaline granites. These dykes have widths up to five metres with no preferred orientation and they contain varying amounts of pyrite and magnetite along with minor copper sulphides and oxides.

The calc-alkali granites typically depict very blocky weathering and are generally massive, fine to coarse-grained, light whitish pink, and weak to moderately gossanous. Mafics include hornblende and biotite, while the dominant feldspars are primarily orthoclase and/or microcline. Alteration consists of weak to strong limonite and disseminated mineralization within the rocks is typically absent. Both the Duckling Creek syenite and the Osilinka granites host the gold-bearing quartz veins and the quartz stockworking typical of the AD Zone.

Item 10: Deposit Types

The initial mineral exploration identified disseminated sulphide mineralization in the strongly magnetic and altered Duckling Creek syenite. Drilling by Amoco in 1974 returned 0.39% copper over 36.2 metres and 0.76% copper over 15.2 metres (best hole).

Work by Cyprus in 1990 identified gold/silver bearing quartz veins and stockworks hosted in syenite and granite. These occurrences may also host copper. The main gold-bearing veins (Radio vein, AD vein, Zulu vein and Rainbow vein) are typically white to grey coarse grained quartz with trace to 40% sulphides and hematite. These westerly trending veins intrude both the Duckling Creek Syenite and the Osilinka Granite making them possibly related to the Osilinka intrusions but definitely younger than the Duckling Creek Syenite. Work by J. Nelson and R. Carmichael in Geological Field Work 2002, Paper 2003-1 studied and modeled these vein occurrences. '*The veins are quartz-rich, with pyrite, chalcopyrite, galena, sphalerite, rare clumps of scheelite in the Zulu vein and in a few instances, visible gold; elevated gold values are accompanied by silver, bismuth* *and tungsten. This geochemical signature, along with the possible Cretaceous host granite suggests that this may be an intrusion related gold system'.*

Item 11: Mineralization

The Duckling Creek Syenite hosted copper sulphide mineralization that occurs in the southeast property area and is not related to the younger auriferous quartz veins.

The vein mineralization occurs primarily as structurally controlled quartz veins and stockwork zones, hosted by both the syenite intrusive and the granitic intrusive, that contain pyrite, chalcopyrite, magnetite, sphalerite, and/or galena. Currently, three such mineralization zones have been identified: the AD zone, the Radio vein, and the SW zone. The former occurs in the calc-alkaline granite, near the contact, while the latter two occur in the syenite. The zones are associated with west trending structures and gold zones typically show a distinct Au-Ag-Bi-W-As-Sb-Co-Pb association.

Item 12: Exploration

Exploration on the Hawk property has consisted of geological mapping, geochemical sampling (soil, rock and silt) and diamond drilling. On June 13th and June 14th the author and a crew of two visited the Hawk property, reviewed the historic core and collected 22 silt samples from road accessible drainages in the property area. A total of 21 core samples were retained. All silt and core samples were sent to Assayers Canada for geochemical analysis. The resulting values can be found in Appendix i. The resulting values were compared to the assay values from the previous drill programs (Appendix i). The results of these surveys are compiled with samples of the 2010 program as this report.

A total of 2421 soil sample locations and results were compiled in an XL database and plotted for copper and gold using the Manifold GIS program. Colour coded dot plots are given for copper and gold in soils, rocks, and silts as Figures 4-1, 4-2, 5-1, 5-2 and 6-1, 6-2 respectively.

Item 13: Drilling

All of the historic diamond drill data contained in company and assessment reports has been reviewed and should be compiled and digitized into one database. All of the drilling has been completed prior to 43-101 standards. The first drilling on the Hawk property commenced in 1974 by Amco Canada, in which a total of 750 metres was drilled in four holes. The core was analyzed for copper, and the best hole returned 0.39% copper over 36.2 metres and 0.76% copper over 15.2 metres.

In October of 1990 Cyprus began a diamond drilled program in the AD vein zone in which 898 metres were drilled from eight holes. Significant gold values were found in holes HK 90-01 through HK 90-05. Subsequent drilling, conducted by Redcorp Ventures Ltd in 2003, included a total of 1,534 metres of core from twelve diamond drill holes testing the AD, Radio, and Zulu vein zones.

All historic drill data was compiled and used to create the plan map. Figure 3 shows a plan view of the drill holes along with property geology.

Item 14: Sampling Method and Approach

The author spent two days on the property reviewing the core and retaining specific samples for analysis. All core samples were retrieved from the partly broken core boxes found in the core storage area on the Hawk property.

Silt samples were taken where possible from accessible drainages throughout the property.

Item 15: Sample Preparation, Analyses and Security

The core samples retrieved in 2010 were placed in rice bags and shipped to Assayers Canada, 8282 Sherbrooke Street in Vancouver where they were analyzed for gold and multi-element ICP. Assayers sample preparation and analytical procedures are given in the Appendix.

Item 16: Data Verification

The location data was merged with the analytical results and checked for number and merging errors. Besides including routine blanks, assayers conducted regular checks on assays greater than 1000 ppb gold.

Item 17: Adjacent Properties

The area surrounding the Hawk Property is covered by mineral tenure. The Lorraine Copper-Gold alkalic porphyry, also hosted by the Duckling Creek Syenite, is 20 kilometres southeast of the Hawk Property.

Item 18: Mineral Processing and Metallurgical Testing

Mineral processing has not been conducted on the property.

Item 19: Mineral Resource and Mineral Reserve Estimates

There are no current estimates on mineral reserves or resources.

Item 20: Other Relevant Data and Information

No relevant data or information is known to the authors that would influence this report.

Item 21: Interpretation and Conclusions

The area of the Hawk property is underlain by phases of the Hogem Batholith and the older Duckling Creek Syenite occurs in the southern property area. The property hosts two styles of mineralization. First, copper and gold mineralization occurs as disseminated sulphides hosted in altered Duckling Creek Syenite in the southeast property area.

Second, east-west structurally controlled auriferous quartz veins intrude the Duckling Creek Syenite and younger Osilinka Granite in the central property area. Work on the Hawk property has identified four distinct 280° trending vein systems in a one kilometre span from north to south as the AD, Zulu, Rainbow, and Radio veins. The author concurs with modeling the structurally controlled auriferous quartz veins as Cretaceous Age Intrusion Related gold model.

The AD vein was discovered by Cypress in 1990 as an outcrop that reportedly graded 2.8 oz/tonne gold over three metres. Drilling has tested the vein to a maximum depth of 150 metres and has outlined a steep dipping vein five to ten metres wide with grades ranging from 0.5 grams to 20 grams gold in drill core and 70 grams gold on surface. There also appears to be at least one secondary vein structure at depth in the AD zone.

The following two tables list significant historic values obtained from drill holes located in the AD zone.

AD vein - DDH	From (m)	To (m)	Width (m)	Au oz/ton
HK 90-1	57.50	62.65	5.15	0.2
	59.65	61.15	1.50	0.58
HK 90-2	64.10	66.90	2.80	0.27
HK 90-3	54.00	54.50	0.50	0.194
HK 90-4	79.00	80.00	1.00	0.86
	100.00	101.35	1.30	0.44
HK 90-5	31.55	33.55	2.00	0.128

AD Vein - DDH	From (m)	To (m)	Length (m)	True Width(m)	Au (gpt)	Metallic Au (gpt)	Ag (gpt)	Cu (%)
HK02006	103.72	108.18	4.46	1.9	4.62	4.41	31.94	0.33
	118.18	129.77	11.59	5	4.66		25.06	0.48
incl.	119	122.85	3.85	1.6	8.6		35.37	0.99
	140.5	142.34	1.84	0.76	1.3		1.2	0.03
	148.65	149.81	1.16	0.48	2.64		3.0	0.3
HK02007	103.77	104.91	1.14	0.47	4.69		7.84	0.58

Drilling has tested the Zulu vein to a maximum depth of 120 metres and the following table lists significant historic values obtained from drill holes located in the Zulu zone.

Zulu Vein - DDH	From (m)	To (m)	Length (m)	True Width(m)	Au (gpt)	Metallic Au (gpt)	Ag (gpt)	Cu (%)
HK02008	104.85	105.18	0.33	0.2	3.97	4.07	1.6	0.07
HK02009	63.93	64.7	0.77	0.7	3.92	3.51	6.6	0.92
HK02010	116.74	117.64	0.9	0.5	0.11		0.2	0.01
HK02011	67.0	69.3	2.3	1.8	4.43		1.47	0.19

Incl	67.0	67.25	0.25	0.2	28.2	29.27	6.8	0.82
HK02012	106.65	107.03	0.38	0.2	11.23	14.7	9.2	1.15

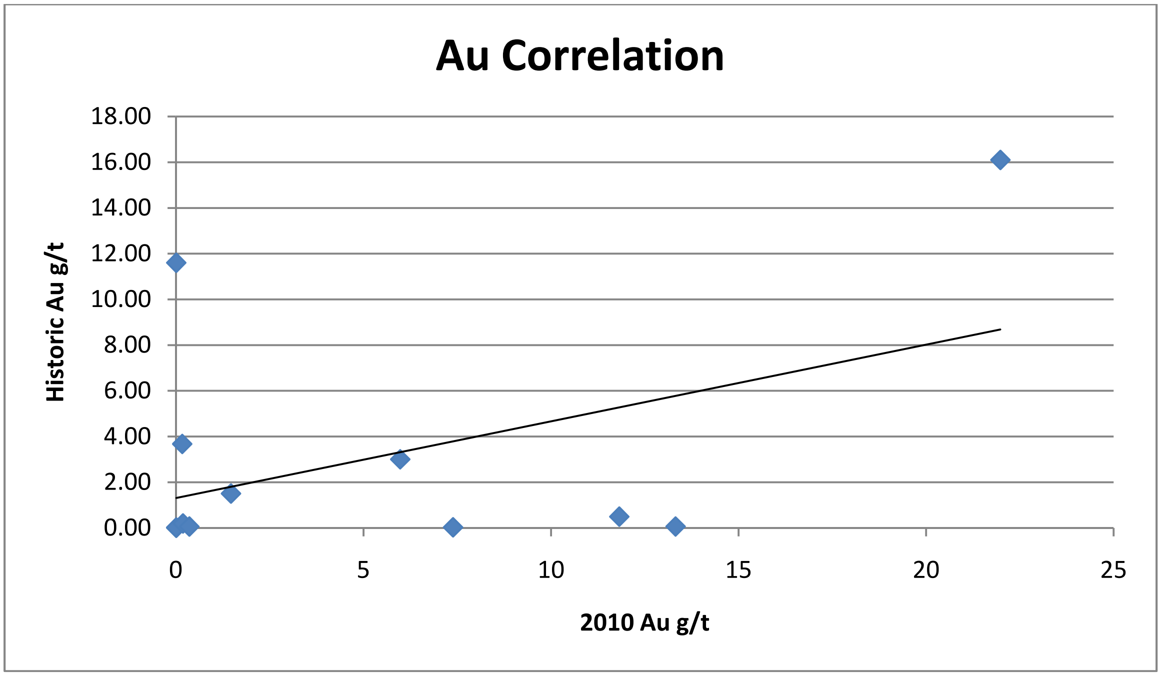
Drilling has tested the Radio vein to a maximum depth of 150 metres and the following table lists significant historic values obtained from drill holes located in the Radio zone.

Radio Vein - DDH	From (m)	To (m)	Length (m)	True Width(m)	Au (gpt)	Metallic Au (gpt)	Ag (gpt)	Cu (%)
HK02001	29.97	30.18	0.21	0.19	11.6	18.79	7.4	1.62
	32.02	32.17	0.15	0.07	6.75	8.97	4.4	1.11
	43.75	43.98	0.23	0.14	10.8	11.18	17.8	2.06
HK02002	15.97	16.4	0.43	0.33	16.1	14.5	7.6	1.62
HK02003	90.65	90.81	0.16	0.14	3.92		3.0	0.52
HK02004	58.6	59.55	0.95	0.9	4.42	4.19	3.61	0.33
HK02005	27.3	27.62	0.32	0.2	11.51	12.3	5.14	0.57
	50.6	51.1	0.5	0.4	6.19	5.16	2.2	0.26
	104.51	104.57	0.06	0.06	12.8	12.2	10.0	0.69

To accurately determine the true width and grade of the AD, Zulu, Rainbow, and Radio veins more drilling needs to be conducted in the area. The veins occur in both types of intrusive (the syenite and the calc-alkali granites), suggesting that they are not related to the copper mineralization hosted in altered Duckling Creek Syenite.

During the 2010 exploration program samples of historic diamond drill core were collected and analyzed for gold and multi element ICP. This data is correlated as 2010 and Historic Core Data Appendix and plotted as the Gold Correlation Graph Figure 7. The graph shows a poor reproducibility for some of the gold intersections which may in part be due to the nuggetty nature of the gold mineralization.

Figure 7: Au Correlation Graph



The 2010 silt sampling results are listed in the appendic and plotted as figure 4-1 and 5-1. When this new data is compiled with the historic soil and rock data it identifies drainages with anomalous copper and gold values that have not been subject to follow-up exploration.

Item 22: Recommendations

Induced Polarization and magnetic surveys in conjunction with soil and rock sampling would identify the extent of porphyry copper and/or gold mineralization in the Duckling Creek Syenite in the area of the Amoco drill holes.

Follow-up of copper and gold in soil anomalies has identified four parallel vein structures on a 280° to 290° trend (AD, Radio, SW and Zulu). The Rainbow vein with a strike of approximately 90° represents a separate mineralized structural orientation. Additional prospecting of copper and gold in soil anomalies may identify additional vein structures. An induced polarization survey should be considered to assist in mapping veins, alteration, and shears. Ultimately all the vein structures need more detailed evaluation by systematic panel sampling on surface and diamond drilling. The drilling to date has shown a real nugget effect in the drill core with values from less than a gram per tonne to 28 grams per tonne over short intervals. Some of this nugget effect could be minimized using a larger sample generated with larger diameter drill core.

Item 23: References

Carmichael, R.G. (2003). Geological, Geochemical, and Diamond Drilling Report on the Hawk Property, Assessment Report 27113.

Game, B.D. (1996). Geological, Geochemical, and Geophysical Report on the Hawk Gold Property, Assessment Report 24378.

Kahlert, B.H. (1992). Geochemical Assessment Report on the Haw Claim Group, Assessment Report 22605.

McCrossan, E. (1991). Geochemical Assessment Report on the Haw West, Haw East, Haw South, and DEN Claim Groups, Assessment Report 21713.

Nelson J, Carmichael B, and Gray M (2002) Innovative Gold Targets in the Pinchi Fault/Hogem Batholith Area, Geological Fieldwork 2002, Paper 2003-1

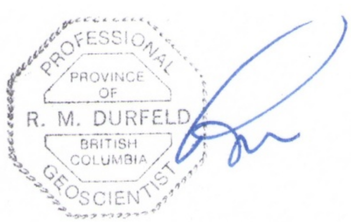
Redcorp Ventures Ltd. (2002). Hawk Property Summary.

Stevenson, D.B. (1991). A Geological, Geochemical, Geophysical and Diamond Drilling Report on the Hawk Property, Assessment Report 21412.

Item 24: Cost Statement

	HAWK COPPER / GOLD PROJECT 2010				
Field Program					
June 1 to June 15, 2010					
	Core Sorting / Relogging / Sampling and Silt Sampling				
Travel / Room / Board					
	1 4X4 Pickup	2127	km	@ 1.00/km	$2,127.00
	Travel Expense	1.1		762	$838.20
	Camp Costs	12	manday	@ $110/day	$1,320.00
Wages					
	RM Durfeld, P.Geo				
Geologist	(June 1 to 15, 2010)	39	hour	@ $100/hour	$3,900.00
	A. Penner				
Assistant	(June 1 to June 15, 2010)	66	hour	@ $36/hour	$2,376.00
	N. Brooker				
Assistant	(June 1 to June 15, 2010)	66	hour	@ $36/hour	$2,376.00
Analytical					
	2010 Sampling				
	Core Samples	21	core	@ $30.50	$640.50
	Silt Samples	22	silt	@ $29.10	$530.20
Reporting / Historic Data Compilation					
Wages					
	RM Durfeld, P.Geo				
Geologist	(June 15 to August 15, 2010)	8	hour	@ $100/hour	$800.00
	A. Penner				
Assistant	(June 15 to August 15, 2010)	10	hour	@ $36/hour	$360.00
	N. Brooker				
Assistant	(June 15 to August 15, 2010)	15	hour	@ $36/hour	$540.00
	Drafting and Plotting				$400.00
	Report				$1,500.00
	TOTAL 2010 HAWK PROJECT COST				**$17,707.90**

Dated at Williams Lake, British Columbia this 23rd day of August, 2010.



R.M. Durfeld, B.Sc., P.Geo.

Item 25: Certificate of Author, Rudi M. Durfeld

I, Rudolf M. Durfeld, P.Geo. do hereby certify that:

1. I am currently employed as a consulting geologist by Durfeld Geological Management Ltd.

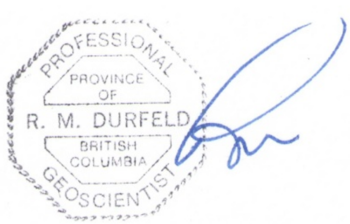
2. I am a graduate of the University of British Columbia, B.Sc. Geology 1972.

3. I am a member of the Canadian Institute of Mining and Metallurgy. That I am registered as a Professional Geoscientist by the Association of Engineers and Geoscientists of B.C. (No. 18241).

4. I have worked as a geologist for some 30 plus years since my graduation from university.

5. I am the author of this report which is based on:
    a. my supervision, observations and participation in the 2010 Hawk Exploration Project.
    b. compilation of the 2010 results with all the previous data.
    c. my personal knowledge of the property area and a review of available government maps and assessment reports.

Dated at Williams Lake, British Columbia this 23rd day of August 2010.



R.M. Durfeld, B.Sc., P.Geo.

Item 26: Illustrations

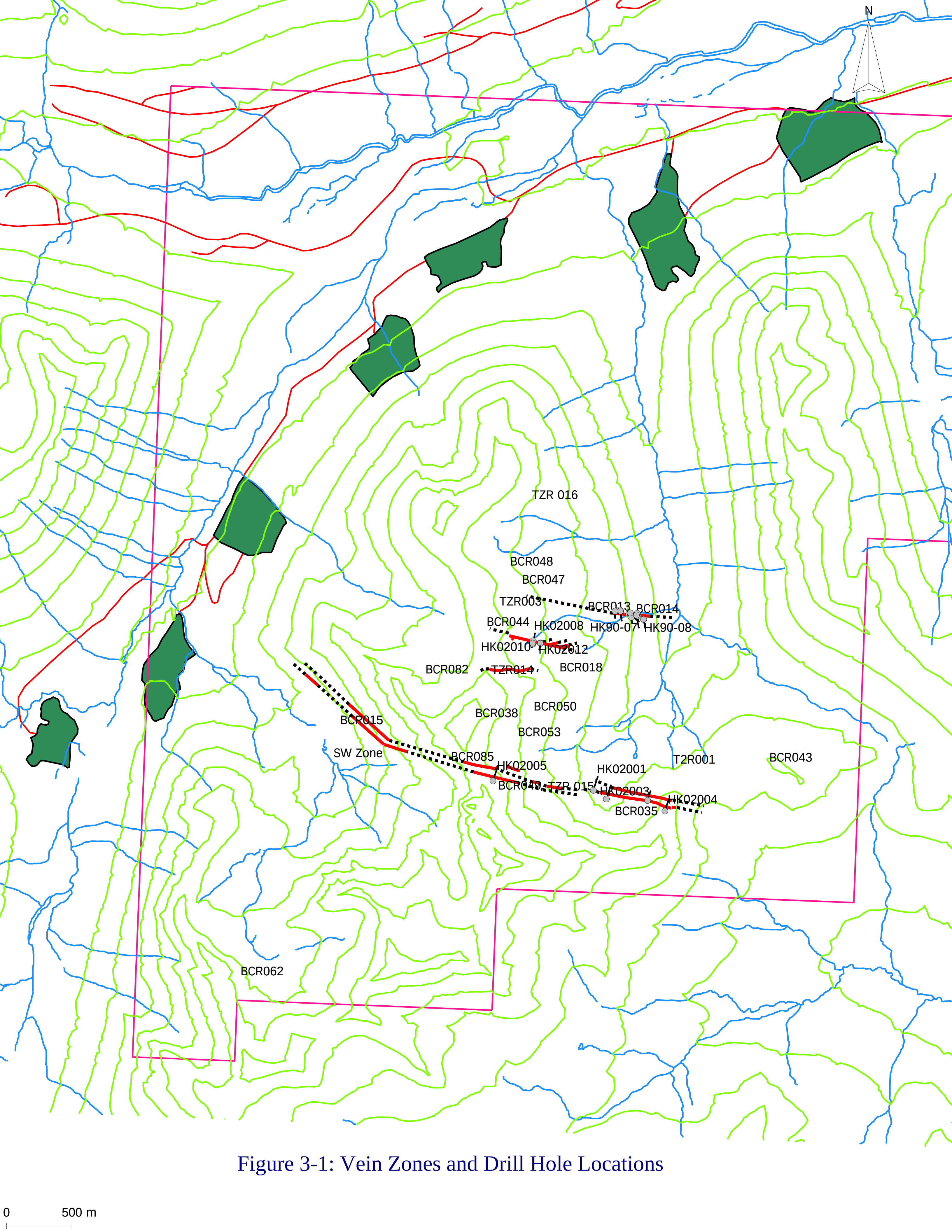


Figure 3-1: Vein Zones and Drill Hole Locations

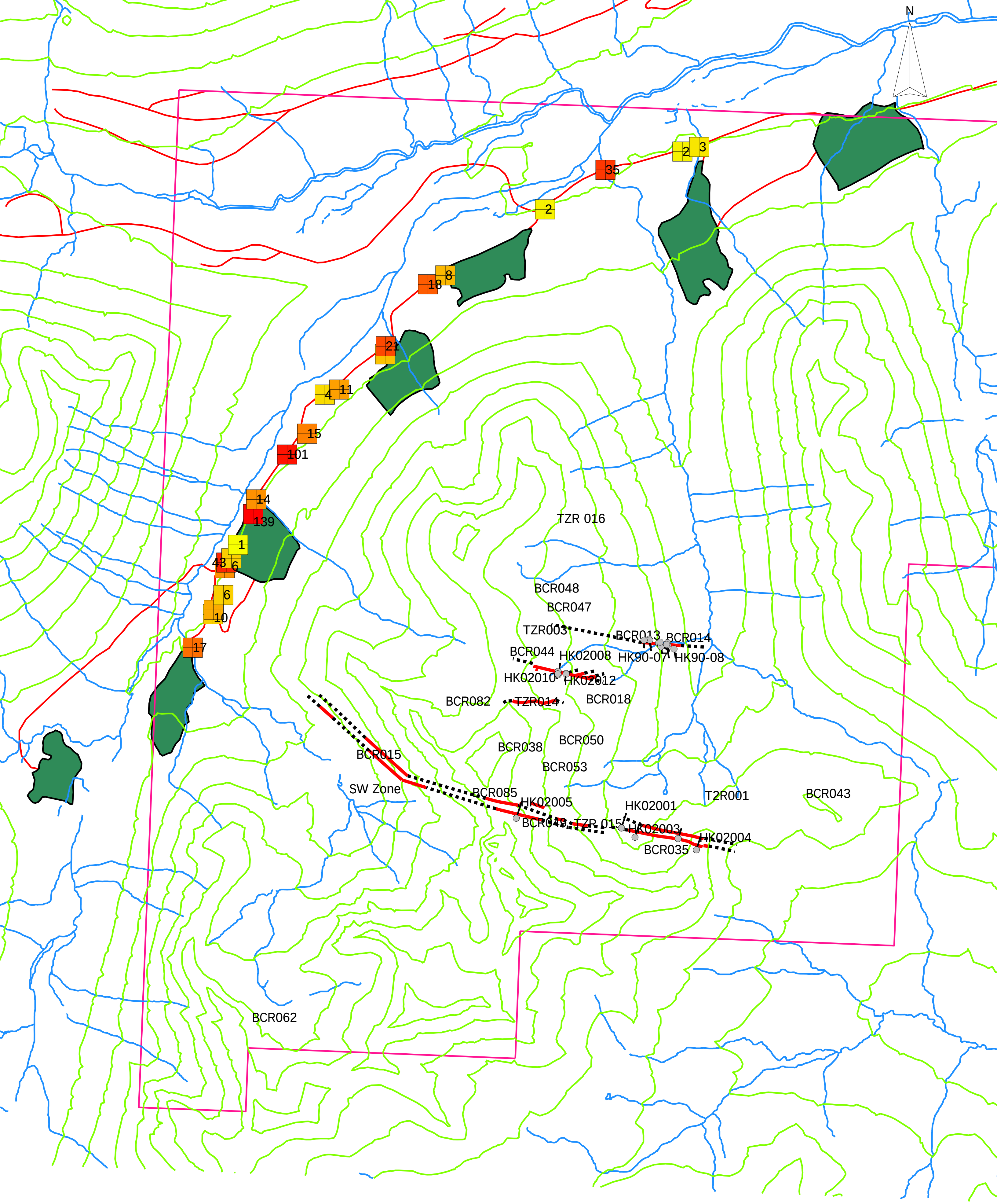


Figure 4-1: 2010 Gold in Silt

0 500 m

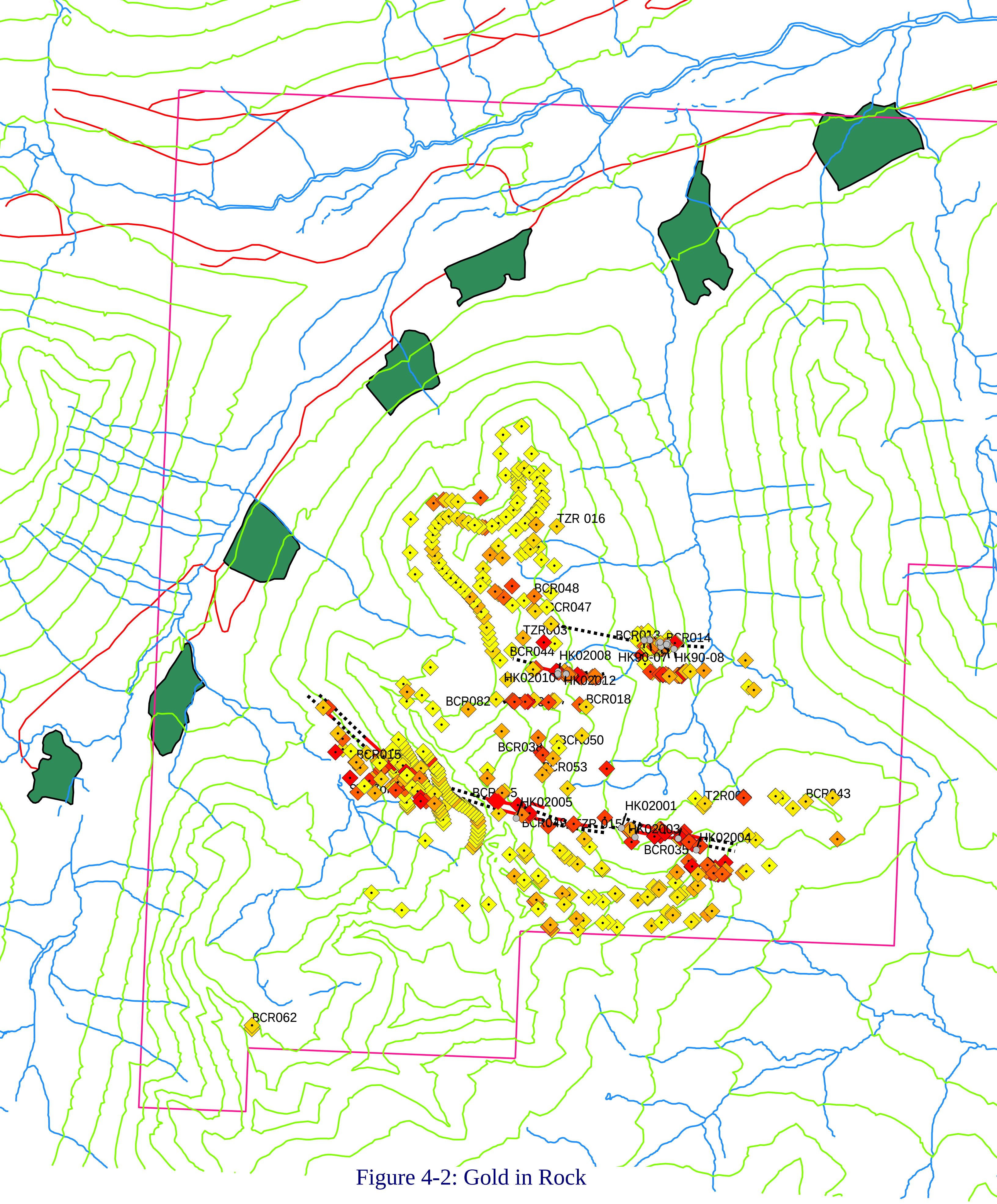


Figure 4-2: Gold in Rock

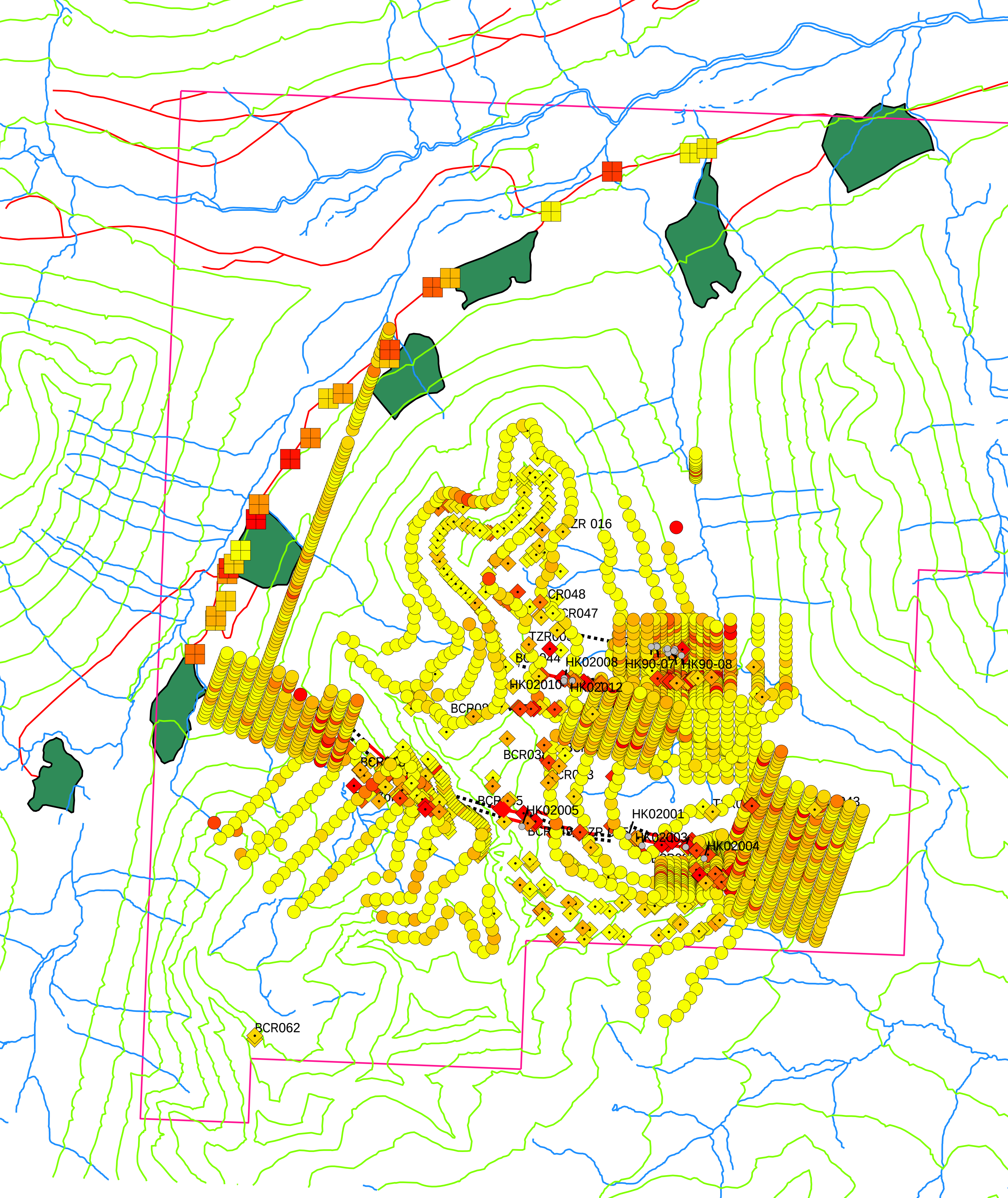


Figure 4-3: Gold in Rock Silt and Soil

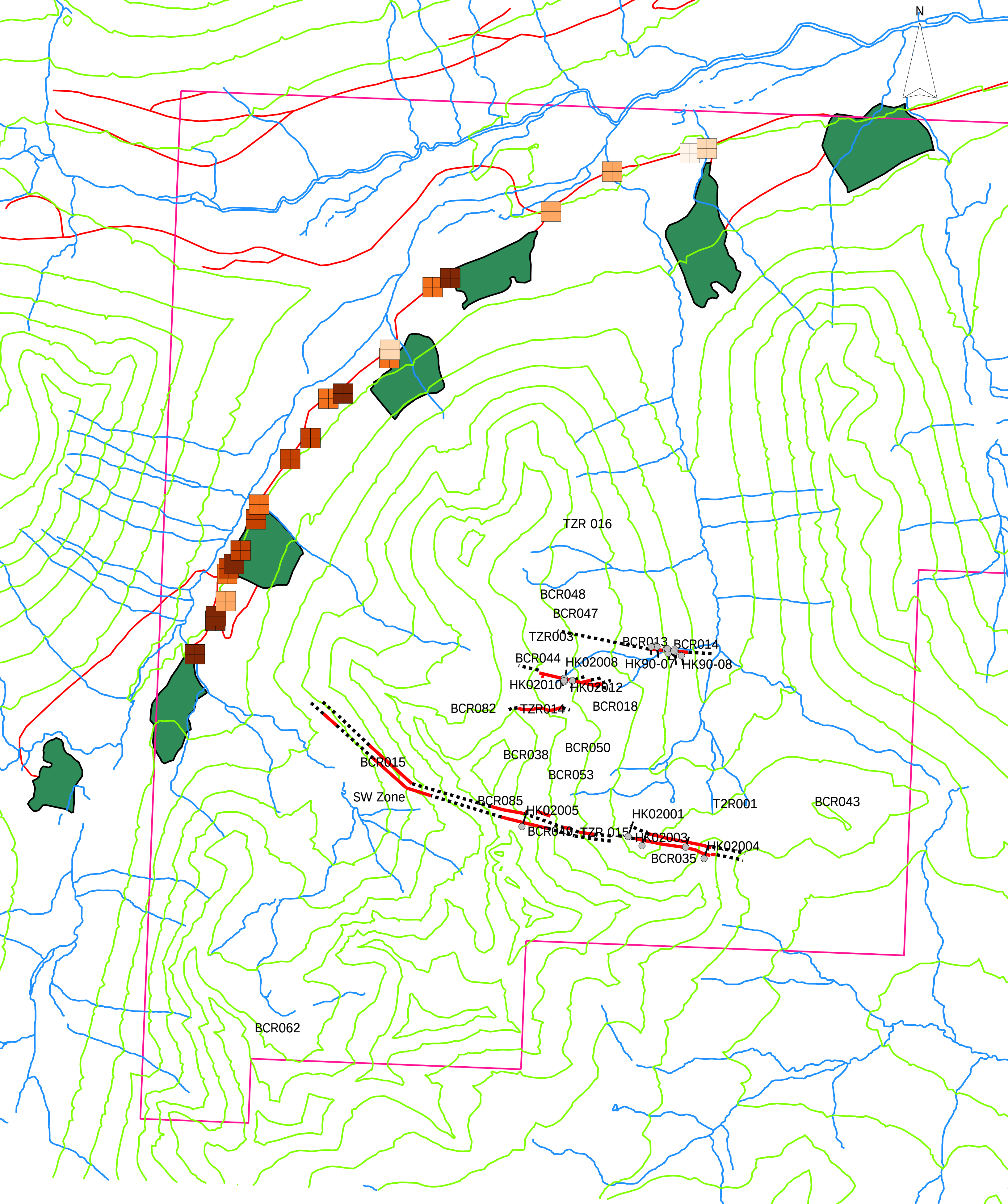


Figure 5-1: 2010 Copper in Silt

0 500 m

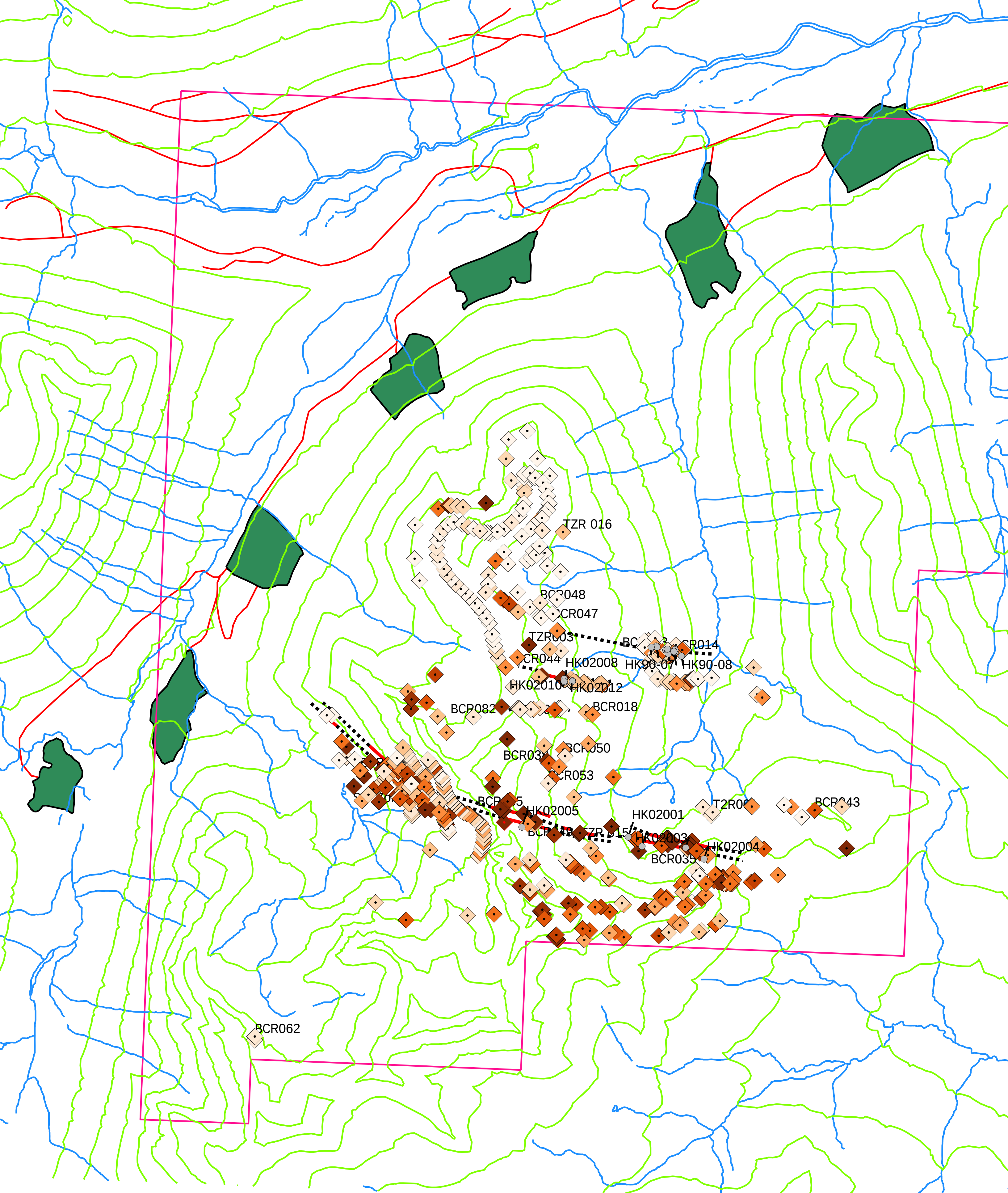


Figure 5-2: Copper in Rock

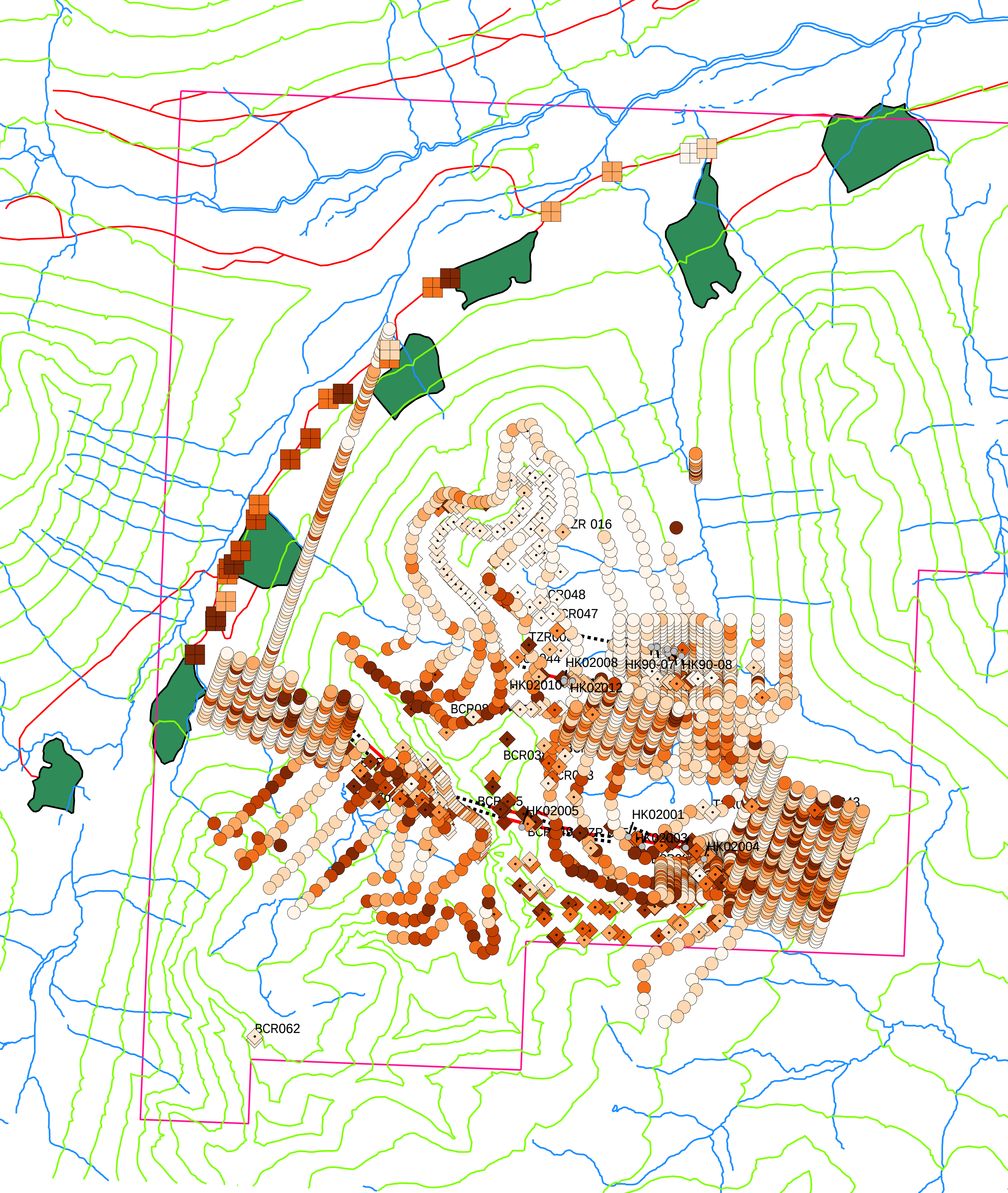


Figure 5-3: Copper in Rock Silt and Soil.

APPENDICES

2010 Core Sample Descriptions
2010 Silt Sample Descriptions
2010 Assay Certificates
Analytical Procedures

2010 Core Sampling

Sample	Drill Hole	From	To	Au g/t	Ag ppm	Cu ppm	Description
C328202	HK02002	132.8	134.8	<0.01	<0.2	28	QZ-eye porphyry, pinkish angular fragments (kspar), slightly magnetic, minor CPY in magnetite, trace PY, little chlorite/epidote alt, possible Cu
C328203	HK02002	141.4	142.4	0.12	<0.2	17	megascopic: mottled beige/pink, xcut silicified felsic zone, brecciated, aphanitic w/subangular fragments, irregular feldspars, fine grained matrix, anhedral to euhedral PY, bluish mineral (hematite, possibly fine grained bornite), non-magnetic, possibly some Cu, steel grey mineral w/ perfect cleavage (galena or arsenopyrite)
C328204	HK02008	87.17	87.5	<0.01	<0.2	3	altered felsic QZ-eye porphyry, very siliceous, non-magnetic to trace magnetic, trace dark grey sulphide
C328205	HK02007	65.53	66	<0.01	<0.2	3	QZ eye porphyry (rounded QZ eyes in a fine felsic matrix w/fine grained sulphides), pinkish beige, trace CPY and PY, trace magnetite
C328206	HK02005	106.5	107	<0.01	<0.2	12	QZ eye porphyry, siliceous felsic breccia, large feldspar grains & QZ-eyes, 5-10% mafic fragments alt to chlorite & epidote, angular features, same dark grey sulphide mineral, some magnetite (strongly magnetic in spots)
C328207	HK02005	124.5	125	<0.01	<0.2	4	chlorite alt shear zone in intrusive, part of zone has siliceous matrix w/ disseminated sulphide, felsic breccia appears healed w/hematite & fine sulphides, some fine grained bornite
C328262	90-4	111	112	<0.01	<0.2	1	QZ-porphyry, fine felsics, siliceous, fine grained veining
C328263	HK02001	30	30.18	0.01	26.2	>10000	QZ-vein w/CPY & PY, red mineral (hematite), specularite
C328264	90-3	30		<0.01	<0.2	46	QZ-porphyry, mafic fragments in a finer felsic matrix, trace steel-grey sulphides, non-magnetic
C328265	90-3	65		0.02	<0.2	81	fine felsic rock w/QZ-eyes, similar to C328264
C328266	HK02007	105		11.82	16	>10000	QZ-vein, dark grey sulphides, bornite, CPY & PY, specularite
C328267	90-4	49	50	0.01	<0.2	114	light beige altered band in QZ porphyry, hematite, possibly garnet or epidote, siliceous host rock
C328268	90-4	100	100.6	1.47	13.9	622	QZ-vein porphyry, definite QZ along w/milky felsic mineral, PY & CPY
C328269	90-4	79	80	5.98	2	347	QZ-vein breccia w/PY & lesser CPY
C328270	90-7	54.6		7.39	3.9	1511	QZ-vein matrix w/minor PY
C328271	90-3	100	100.6	0.01	<0.2	11	QZ-porphyry, fine grained mafics, evidence of oxidation
C328272	HK02011	69		0.17	2.6	6109	QZ-porphyry, brecciated, kspar grains in siliceous fine matrix, QZ veins <1cm & 50° to core axis w/abundant PY and CPY
C328273	90-7	70	71	0.19	0.3	14	QZ-vein w/PY
C328274	HK02002	16		21.98	14.3	>10000	strong QZ-Cu vein, strong CPY in QZ vein
C328275	HK02006	148		13.32	12.8	5468	QZ breccia, sulphide healed
C328276	90-03	54.5		0.36	0.6	261	QZ breccia w/fine sulphide

2010 Hawk Core Comparison

2010 Core Sampling							**Historic Core Sampling**						
Drill Hole	**Sample No.**	**From**	**To**	**Au g/t**	**Ag ppm**	**Cu ppm**	**Drill Hole**	**Sample No.**	**From**	**To**	**Au g/t**	**Ag ppm**	**Cu ppm**
HK02001	C328263	30	30.18	0.01	26.2	>10000	HK02001	13002	29.97	30.18	11.6	7.4	16200
HK90-03	C328264	30		<0.01	<0.2	46	HK90-03	32185	30.45	32.45	0	0.4	
HK02007	C328266	105		11.82	16.0	>10000	HK02007	13078	104.91	105.58	0.5	0.2	323
HK90-04	C328268	100	100.6	1.47	13.9	622	HK90-04	32244	100.05	101.35	1.5	3.1	
HK90-04	C328269	79	80	5.98	2.0	347	HK90-04	32235	79	80	3.0	1.2	
HK90-07	C328270	54.6		7.39	3.9	1511	HK90-07	32321	53	55	0.02	0.4	
HK90-03	C328271	100	100.6	0.01	<0.2	11	HK90-03	32207	101	103	0.02	0.4	
HK02011	C328272	69		0.17	2.6	6109	HK02011	13113	68.73	69.3	3.7	1.4	2808
HK90-07	C328273	70	71	0.19	0.3	14	HK90-07	32329	69.65	71.65	0.2	0.6	
HK02002	C328274	16		21.98	14.3	>10000	HK02002	13011	15.97	16.4	16.1	7.6	16200
HK02006	C328275	148		13.32	12.8	5468	HK02006	13072	147.95	148.65	0.1	1.2	24
HK90-03	C328276	54.5		0.36	0.6	261	HK90-03	32195	54.5	56.5	0.1	0.3	

2010 Silt Sampling

Sample No.	Easting	Northing	Au ppb	Ag ppm	Cu ppm	Description
NB-01	329988	6213250	17	<0.2	238	Silt from an active major stream near a cut block & the end of the property, silt taken with roots to gain smaller grains, abundant outcrop present (quartz-eye granite)
NB-02	330136	6213493	6	0.3	746	Silt from active portion of a small intermittent stream with little water, silt taken with roots and other organics
NB-03	330141	6213525	10	<0.2	327	Silt sample from active area of a small stream, somewhat intermittent, good flow, silt with mixed organics and some gravel, silt taken with roots Amongst rubble: primarily quartz-eye granite w/one large boulder, strongly magnetic, siliceous, kspar grains, abundant epidote and chlorite, strongly altered (appears to be altered equivalent to previous quartz-eye granite)
NB-04	330211	6213634	6	<0.2	72	Silt from small stream above fork in the road (above upper road), silt taken with roots and other organics, relatively narrow stream
NB-05	330221	6213830	14	<0.2	95	Silt from slightly larger stream, fast flow, silt taken with organics and gravel, silt taken from three separate locations along the stream
NB-06	330233	6213870	43	0.4	137	Silt from larger, fast moving stream, major drainage area, abundant gravel, less abundant silt
NB-07	330270	6213902	6	<0.2	181	Silt from smaller, narrow, fast moving stream, difficult to get good sample due to abundant organics, samples taken from three sites along stream
NB-08	330318	6213999	1	<0.2	142	Silt from intermittent small narrow stream, sample taken with gravel and organics (roots)
NB-09	330429	6214224	139	<0.2	123	Silt from stronger, faster moving stream with abundant gravel
NB-10	330451	6214331	14	<0.2	107	Silt from main major creek, wide, extremely fast moving, silt with organics and gravel
NB-11	330676	6214658	101	<0.2	165	Silt from small stream, relatively fast water, abundant good silt
NB-12	330822	6214810	15	<0.2	123	Silt from moderately small stream surrounded by snow, drainage from up above, good silt and abundant organics
NB-13	330951	6215095	4	<0.2	79	Silt from small wide stream, moderately slow moving water, abundant silt, good sample Outcrop (near road and sample site): very siliceous, similar to previous samples, chlorite and epidote alteration, most likely a quartz-eye granite
NB-14	331057	6215131	11	0.2	191	Silt from slow moving small stream, abundant snow surrounding, abundant outcrop near stream (same as previous, quartz-eye granite)
NB-15	331391	6215388	7	0.6	79	Silt from relatively fast moving, medium sized stream, abundant outcrop (similar to previous samples, quartz-eye granite), abundant organic matter, little silt, poor sample
NB-16	331395	6215447	21	<0.2	36	Silt from fast moving stream just before fork in the road, abundant silt and few organics, some outcrop (no change, quartz-eye granite, primarily intrusive rubble)
NB-17	331703	6215898	18	0.5	90	Silt from moderately large stream, organics taken with silt, abundant outcrop (light organish/grey weathered surface, pegmatitic, quartz/kspar veining, abundant quartz, mafics < 5%, no chlorite or epidote alteration, no visible sulphide, still most likely quartz-eye granite)

NB-18	331830	6215964	8	0.8	181	Silt from moderately large, fast moving stream, good silt sample, abundant outcrop (near road): quartz-eye granite (felsic, siliceous, fine to medium grained, mafics < 5%, varying alterations, some hematite, non-magnetic)
NB-19	332557	6216445	2	<0.2	67	Silt from major drainage, large creek with fast moving water, few organics, abundant gravel, less silt, relatively poor sample
NB-20	332998	6216733	35	<0.2	45	Silt from major drainage, wide channel, fast moving water, good silt sample, located under bridge, abundant outcrop: quartz-eye granite (felsic, siliceous, quartz-eyes, similar previous sites, mafics < 5%)
NB-21	333559	6216866	2	<0.2	24	Silt from small, slow moving drainage, intermittent stream, abundant coarse debris, difficult to find good silt, no outcrop present
NB-22	333681	6216900	3	<0.2	27	Silt from medium sized stream next to camp, relatively slow moving water in sample location, no outcrop in the immediate vicinity, abundant silt

Assayers Canada
8282 Sherbrooke St.
Vancouver, B.C.
V5X 4R6
Tel: (604) 327-3436
Fax: (604) 327-3423

Quality Assaying for over 35 Years

Assay Certificate

0V-1048-RA1

Company: **Durfeld Geologieal Ltd**
Project: Hawk
Attn: Rudi Durfeld

May-08-10

We *hereby certify* the following assay of 21 rock samples
submitted Jul-16-10

Sample Name	Au g/tonne	Au-check g/tonne	Cu %	Sample-wt kg
C328202	<0.01	<0.01		1.8
C328203	0.12			1.0
C328204	<0.01			0.6
C328205	<0.01			0.7
C328206	<0.01			0.8
C328207	<0.01			0.3
C328262	<0.01			0.9
C328263	0.01		2.67	0.2
C328264	<0.01			0.3
C328265	0.02	0.02		0.4
C328266	11.82		3.47	0.3
C328267	0.01			0.5
C328268	1.47			0.2
C328269	5.98			0.2
C328270	7.39	7.23		0.4
C328271	0.01			0.5
C328272	0.17			0.3
C328273	0.19			0.2
C328274	21.98		3.28	0.1
C328275	13.32			0.1
C328276	0.36			0.1
*0211	2.13			
*ME-3			0.183	
*BLANK	<0.01		<0.001	

Au by FA. Cu 4acid digest, AA finish.

Certified by

Assayers Canada

8282 Sherbrooke St., Vancouver, B.C., V5X 4R6

Tel: (604) 327-3436 Fax: (604) 327-3423

Report No : 0V1048RJ

Date : May-08-10

Sample type : ROCK

Durfeld Geological Ltd

Project : Hawk

Attention : Rudi Durfeld

Multi-Element ICP-AES Analysis

Aqua Regia Digestion

Sample Number	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Hg ppm	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P %	Pb ppm	S %	Sb ppm	Sc ppm	Sr ppm	Th ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm	Zr ppm
C328202	<0.2	0.29	<5	426	<0.5	<5	1.30	1	4	28	28	1.08	1	0.22	<10	0.08	329	20	0.05	1	0.010	16	0.09	<5	<1	321	<5	0.01	<10	<10	32	<10	47	2
C328203	<0.2	0.15	<5	532	<0.5	<5	0.87	<1	2	34	17	0.62	<1	0.13	<10	0.02	252	3	0.06	1	0.009	2	0.21	<5	<1	74	<5	0.02	<10	<10	19	<10	12	4
C328204	<0.2	0.25	<5	450	<0.5	<5	1.09	<1	1	62	3	0.52	<1	0.16	<10	0.09	1164	3	0.05	1	0.017	3	0.06	<5	<1	125	<5	<0.01	<10	<10	4	<10	10	<1
C328205	<0.2	0.21	<5	1098	<0.5	<5	1.33	<1	1	57	3	0.46	1	0.15	<10	0.06	373	<2	0.06	1	0.013	6	0.07	<5	<1	138	<5	<0.01	<10	<10	2	<10	18	<1
C328206	<0.2	0.29	<5	69	0.5	<5	0.73	<1	4	37	12	0.76	<1	0.17	<10	0.12	283	4	0.05	1	0.023	4	0.03	<5	<1	118	<5	0.04	<10	<10	25	<10	20	7
C328207	<0.2	0.34	<5	61	0.6	<5	4.99	4	17	32	4	4.80	5	0.18	21	1.09	2222	4	0.03	1	0.220	4	0.17	<5	6	284	<5	0.02	<10	<10	142	<10	89	4
C328262	<0.2	0.24	<5	993	<0.5	<5	0.84	<1	1	53	1	0.27	<1	0.18	<10	0.03	278	2	0.06	1	0.012	3	0.05	<5	<1	102	<5	<0.01	<10	<10	2	<10	2	<1
C328263	26.2	0.07	15	52	<0.5	1719	1.66	17	23	118	>10000	17.94	2	0.05	<10	0.25	>10000	15	0.01	3	0.001	318	7.17	<5	<1	130	6	<0.01	<10	<10	20	68	116	6
C328264	<0.2	0.35	<5	1746	<0.5	<5	3.68	2	11	38	46	2.55	3	0.27	11	0.93	1192	<2	0.05	2	0.136	4	0.18	<5	3	142	<5	<0.01	<10	<10	25	<10	44	2
C328265	<0.2	0.21	<5	1539	<0.5	8	1.23	<1	1	61	81	0.34	1	0.15	<10	0.03	472	<2	0.05	1	0.013	3	0.10	<5	<1	104	<5	<0.01	<10	<10	2	<10	4	<1
C328266	16.0	0.08	<5	57	<0.5	42	3.10	10	10	122	>10000	11.26	4	0.09	<10	0.32	4678	11	0.01	<1	0.005	119	4.75	<5	<1	1051	<5	<0.01	<10	<10	26	28	42	3
C328267	<0.2	0.19	<5	788	<0.5	<5	1.00	<1	3	63	114	0.88	<1	0.15	<10	0.21	269	4	0.05	2	0.031	4	0.15	<5	1	2422	<5	<0.01	<10	14	10	<10	13	1
C328268	13.9	0.10	<5	209	<0.5	40	5.65	16	4	154	622	1.76	6	0.09	<10	0.05	2828	6	0.02	3	0.003	2540	1.41	<5	<1	463	<5	<0.01	<10	<10	1	28	1036	1
C328269	2.0	0.34	<5	82	<0.5	75	1.53	2	12	118	347	3.02	1	0.25	<10	0.04	385	2	0.05	3	0.010	175	2.64	<5	<1	177	<5	<0.01	<10	<10	4	<10	6	1
C328270	3.9	0.29	<5	134	<0.5	414	0.13	3	10	79	1511	4.16	<1	0.28	<10	0.02	1596	20	0.02	2	0.016	261	1.63	<5	<1	90	<5	<0.01	<10	<10	6	<10	35	1
C328271	<0.2	0.23	<5	825	<0.5	<5	0.79	<1	1	64	11	0.40	<1	0.15	<10	0.02	279	<2	0.06	2	0.015	4	0.05	<5	<1	67	<5	<0.01	<10	<10	2	<10	10	<1
C328272	2.6	0.23	<5	229	<0.5	7	0.47	1	4	150	6109	2.03	<1	0.17	<10	0.10	748	5	0.07	3	0.015	20	1.21	<5	<1	33	<5	<0.01	<10	<10	2	<10	20	1
C328273	0.3	0.19	<5	615	<0.5	<5	1.98	<1	2	74	14	0.60	2	0.13	<10	0.02	769	488	0.07	1	0.015	24	0.51	<5	<1	141	<5	<0.01	<10	<10	<1	<10	1	<1
C328274	14.3	0.20	7	68	<0.5	348	0.92	8	9	230	>10000	10.57	<1	0.21	<10	0.34	>10000	44	0.02	6	0.012	126	3.69	<5	1	52	5	<0.01	<10	<10	22	101	59	8
C328275	12.8	0.37	<5	33	<0.5	531	2.21	11	33	131	5468	11.67	5	0.36	<10	0.04	1211	8	0.01	3	0.007	713	9.49	<5	<1	609	<5	<0.01	<10	<10	13	<10	6	3
C328276	0.6	0.91	<5	290	0.5	5	3.23	1	6	79	261	1.88	3	0.67	<10	0.43	2870	7	0.07	3	0.152	22	0.83	<5	1	177	<5	<0.01	<10	<10	19	<10	18	2
Duplicates:																																		
C328202	<0.2	0.29	<5	396	<0.5	<5	1.23	1	4	27	29	1.02	<1	0.21	<10	0.08	312	19	0.05	1	0.009	16	0.08	<5	<1	310	<5	<0.01	<10	<10	30	<10	43	2
C328265	<0.2	0.20	<5	1429	<0.5	7	1.13	<1	1	56	74	0.32	<1	0.15	<10	0.03	425	<2	0.05	1	0.011	3	0.09	<5	<1	97	<5	<0.01	<10	<10	1	<10	4	<1
C328275	11.5	0.35	<5	33	<0.5	490	2.00	10	31	119	4910	10.71	4	0.34	<10	0.03	1071	6	0.01	2	0.007	656	8.60	<5	<1	548	<5	<0.01	<10	<10	12	<10	5	3
Standards:																																		
Blank	<0.2	<0.01	<5	<10	<0.5	<5	<0.01	<1	<1	<1	<1	<0.01	<1	<0.01	<10	<0.01	<5	<2	<0.01	<1	<0.001	<2	<0.01	<5	<1	<1	<5	<0.01	<10	<10	<1	<10	<1	<1
CH-4	1.9	1.68	14	291	1.2	<5	0.60	5	32	105	2132	4.71	<1	1.35	13	1.18	309	3	0.05	52	0.076	21	0.60	<5	7	8	<5	0.18	<10	<10	80	<10	220	9

A .5 gm sample is digested with 5 ml 3:1 HCl/HNO3 at 95°C for 2 hours and diluted to 25ml.

Signed: ______________

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Assayers Canada
8282 Sherbrooke St.
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Quality Assaying for over 35 Years

Geochemical Analysis Certificate

0V-1048-SG1

Company: **Durfeld Geological Ltd**
Project: Hawk
Attn: Rudi Durfeld

May-08-10

We *hereby certify* the following geochemical analysis of 22 silt samples submitted Jul-16-10

Sample Name	Au ppb
NB-01	17
NB-02	6
NB-03	10
NB-04	6
NB-05	14
NB-06	43
NB-07	6
NB-08	1
NB-09	139
NB-10	14
NB-11	101
NB-12	15
NB-13	4
NB-14	11
NB-15	7
NB-16	21
NB-17	18
NB-18	8
NB-19	2
NB-20	35
NB-21	2
NB-22	3
*0211	2440
*BLANK	<1

Au by FA.

Certified by ____________________

ASSAYERS CANADA

Assayers Canada

8282 Sherbrooke St., Vancouver, B.C., V5X 4R6

Tel: (604) 327-3436 Fax: (604) 327-3423

Report No : 0V1048SJ

Date : May-08-10

Sample type : SILT

Durfeld Geological Ltd

Project : Hawk

Attention : Rudi Durfeld

Multi-Element ICP-AES Analysis

Aqua Regia Digestion

Sample Number	Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Hg ppm	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P %	Pb ppm	S %	Sb ppm	Sc ppm	Sr ppm	Th ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm	Zr ppm
NB-01	<0.2	1.19	8	248	0.5	<5	2.16	5	30	10	238	8.93	4	0.18	14	0.90	1739	4	0.02	3	0.359	12	0.09	11	6	218	<5	0.11	<10	<10	402	11	138	5
NB-02	0.3	1.27	<5	415	0.6	<5	1.60	2	19	12	746	5.26	1	0.11	17	0.59	933	3	0.01	5	0.355	2	0.15	7	3	326	<5	0.05	<10	<10	226	<10	93	2
NB-03	<0.2	1.06	<5	246	<0.5	<5	1.19	1	12	8	327	3.09	1	0.07	11	0.50	530	2	<0.01	4	0.295	<2	0.08	5	3	167	<5	0.06	<10	<10	123	11	77	1
NB-04	<0.2	1.05	5	424	<0.5	<5	1.08	2	13	9	72	4.09	2	0.06	<10	0.57	440	3	<0.01	4	0.243	<2	0.05	5	2	159	<5	0.12	<10	<10	159	<10	60	2
NB-05	<0.2	0.84	5	431	<0.5	<5	0.89	3	17	13	95	6.63	1	0.07	11	0.29	930	3	0.01	3	0.231	7	0.06	7	1	119	<5	0.06	<10	<10	295	<10	85	2
NB-06	0.4	1.51	5	775	1.1	<5	1.10	2	14	9	137	4.26	<1	0.07	18	0.28	2034	4	0.01	3	0.307	<2	0.13	6	1	188	<5	0.04	<10	<10	183	<10	83	1
NB-07	<0.2	1.35	<5	870	0.9	<5	1.20	2	14	10	181	4.25	1	0.07	16	0.45	1696	3	0.01	4	0.300	<2	0.11	5	2	154	<5	0.04	<10	<10	170	<10	105	1
NB-08	<0.2	1.08	<5	535	<0.5	<5	1.09	3	20	12	142	6.87	1	0.09	10	0.51	1334	2	0.01	4	0.278	3	0.07	7	2	118	<5	0.07	<10	<10	275	<10	97	2
NB-09	<0.2	0.88	5	374	<0.5	<5	0.84	3	17	11	123	6.12	<1	0.08	11	0.33	966	2	0.01	3	0.253	3	0.05	7	1	110	<5	0.06	<10	<10	252	<10	60	2
NB-10	<0.2	0.87	<5	497	<0.5	<5	0.76	2	11	9	107	4.49	<1	0.07	10	0.26	770	2	0.01	3	0.215	3	0.06	5	1	125	<5	0.04	<10	<10	167	<10	56	1
NB-11	<0.2	1.26	<5	945	0.8	<5	1.16	2	13	10	165	5.17	<1	0.06	16	0.32	887	<2	0.01	2	0.240	<2	0.09	6	2	154	<5	0.06	<10	<10	204	<10	79	2
NB-12	<0.2	1.21	<5	802	<0.5	<5	0.92	3	15	11	123	6.19	<1	0.08	12	0.28	1358	2	0.01	4	0.332	13	0.07	8	1	135	<5	0.04	<10	<10	240	<10	86	2
NB-13	<0.2	1.09	<5	733	0.6	<5	0.62	1	7	6	79	2.07	<1	0.06	11	0.24	765	3	<0.01	3	0.172	3	0.07	<5	2	170	<5	0.03	<10	<10	57	<10	44	1
NB-14	0.2	1.78	<5	1175	0.9	<5	1.02	<1	6	7	191	1.40	<1	0.08	18	0.29	511	2	0.01	3	0.221	34	0.12	<5	1	312	<5	0.03	<10	<10	51	<10	72	1
NB-15	0.6	1.51	<5	2077	0.8	<5	1.80	1	5	6	79	1.90	1	0.05	19	0.17	2053	13	<0.01	3	0.220	9	0.16	<5	2	720	<5	0.02	<10	32	49	<10	63	2
NB-16	<0.2	0.66	<5	704	<0.5	<5	0.39	<1	4	43	36	1.37	<1	0.10	<10	0.14	737	3	0.02	3	0.065	13	0.03	<5	1	119	<5	0.01	<10	<10	33	<10	45	1
NB-17	0.5	1.84	5	2075	0.8	<5	1.41	<1	4	7	90	1.67	<1	0.09	13	0.20	1388	12	<0.01	3	0.211	11	0.13	<5	2	405	<5	0.02	<10	12	40	<10	77	2
NB-18	0.8	2.12	<5	1414	1.0	<5	1.45	1	7	7	181	2.16	<1	0.06	20	0.37	859	13	<0.01	4	0.176	39	0.14	<5	2	453	<5	0.04	<10	24	69	<10	75	1
NB-19	<0.2	1.29	<5	452	<0.5	<5	0.78	1	12	115	67	2.79	<1	0.17	<10	0.64	448	3	0.05	7	0.104	<2	0.03	7	2	131	<5	0.10	<10	<10	82	<10	49	1
NB-20	<0.2	0.57	<5	242	<0.5	<5	0.70	2	10	8	45	4.38	<1	0.05	<10	0.25	590	2	<0.01	2	0.173	8	0.03	5	1	79	<5	0.04	<10	<10	157	<10	50	2
NB-21	<0.2	0.78	<5	130	<0.5	<5	0.51	1	7	5	24	2.84	<1	0.04	11	0.24	358	4	<0.01	1	0.138	2	0.03	<5	1	55	<5	0.04	<10	<10	91	<10	31	1
NB-22	<0.2	0.93	<5	190	<0.5	<5	0.56	1	8	5	27	2.26	<1	0.04	10	0.32	728	7	<0.01	2	0.153	<2	0.04	<5	1	53	<5	0.05	<10	<10	70	<10	43	1
Duplicates:																																		
NB-01	<0.2	1.37	8	289	0.6	<5	2.48	6	35	12	273	10.36	5	0.21	16	1.06	1999	5	0.03	4	0.414	13	0.10	12	6	247	<5	0.12	<10	<10	455	<10	160	6
NB-10	<0.2	0.89	<5	517	<0.5	<5	0.77	2	11	9	110	4.32	<1	0.07	10	0.27	792	2	0.01	3	0.213	2	0.06	5	1	131	<5	0.04	<10	<10	161	<10	57	1
NB-20	<0.2	0.59	<5	246	<0.5	<5	0.75	2	10	8	44	4.54	<1	0.05	<10	0.27	614	3	<0.01	2	0.186	9	0.03	5	1	79	<5	0.04	<10	<10	160	<10	52	2
Standards:																																		
Blank	<0.2	<0.01	<5	<10	<0.5	<5	<0.01	<1	<1	<1	<1	<0.01	<1	<0.01	<10	<0.01	<5	<2	<0.01	<1	<0.001	<2	<0.01	<5	<1	<1	<5	<0.01	<10	<10	<1	<10	<1	<1
CH-4	2.5	1.87	14	310	<0.5	<5	0.62	3	30	112	2196	4.97	<1	1.46	14	1.32	352	4	0.04	57	0.088	7	0.65	12	7	9	<5	0.21	<10	<10	86	<10	211	12

A .5 gm sample is digested with 5 ml 3:1 HCl/HNO3 at 95°C for 2 hours and diluted to 25ml.

Signed: ____________________

Assayers Canada Services Explained

Sample Preparation

Sample preparation procedures are normally fairly straightforward, and can be summarized as:

- **If a sample is wet, it will normally need to be dried**
- **Large samples must be split, often several times, to provide a portion small enough to be handled by the analytical equipment. The size of the final sample is a function of the element being analysed and the analytical method being employed.**
- **The size of particles within the sample must be reduced so that the elements of interest can be properly liberated from the rest of the rock.**

Sample Drying

At Assayers Canada, samples of rock, stream sediments and soils are all dried in an oven at about 60 degrees Celsius. It is possible to dry the samples more quickly (i.e. at a higher temperature), but certain volatile elements (notably Hg) can be lost at higher temperatures.

Sample Size and Particle Size Reduction

The optimum mix of crushing, pulverising and splitting samples to achieve a sample that is small enough and fine grained enough to be analysed, while still giving a fair representation of the element concentrations in the original sample, is a topic about which textbooks have been written, and is a much discussed problem. While the theory and mathematics of the discussion is too complex to be included in this web site, it is advisable that all geologists at least have a cursory understanding of the issues involved here, particularly if the project in question includes very coarse grained ore minerals.

In general, the coarser and less homogenous the distribution of the ore minerals, the finer a specimen should be crushed (or pulverised) before a portion of it is split off for analysis or further sample preparation. Ideally, the entire sample (say 10kg of drill core) would be pulverised to -150 mesh before splitting off a portion for analysis. The trouble with this is that it takes a long time to pulverise a large sample, and hence this would be a very costly solution to the problem.

At Assayers Canada, soil and stream sediment samples (where elements of interest are found in the fine fraction) are passed through an -80 mesh sieve, and the fine fraction is then split (if necessary) and pulverised.

Rock and drill core samples, on the other hand, are first crushed with a jaw crusher and the put through a secondary crusher so that it is 60% less than 10 mesh in size. The sample is then mixed, and a 250-gram sub sample split is taken. The sub sample is then pulverised in a ring pulverizer until 90% of the sample is less than 150 mesh, at which time it is ready for analysis.

Note that coarse gold does not pulverise well, but rather tends to become smeared along the plates of the pulverizer. If a sample is known to contain coarse gold, therefore, it should be sieved after it is pulverised to remove the coarse gold particles. The entire coarse fraction is then analysed, as is a split of the fine fraction. The two assays are then combined to give the total gold content of the original sample.

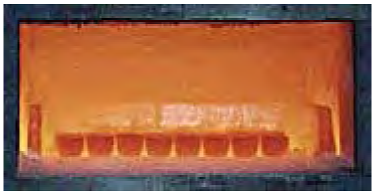
Assayers Canada Services Explained

Gold and Precious Metal Analysis by Fire Assay

Fire Assaying, a technique that has been around for centuries, is still the most generally accepted method of analysis for gold, and platinum group elements.

Though a number of variations are available (depending on the size of sample assayed and the method of final reading of the metal concentration), the basic technique in Fire Assaying for gold involves adding flux (which includes lead) and silver to the pulverised sample and fusing (melting) it. The extra silver acts as a collector of the gold, and, in very low-grade samples, ensures that at the end of the fusing there is enough precious metal to be easily handled.

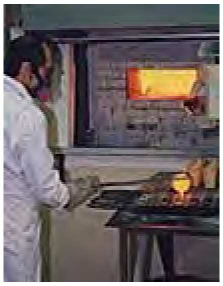
At the end of the fusion process, the resultant molten material is poured into a metal mould and allowed to cool into a lead button (which contains the precious metals) at the bottom, overlain by silica glass slag. The slag is chipped off and discarded, and the lead button is subjected to a second process called cupellation, in which the precious metals are separated from the lead.



In cupellation the lead button (containing the gold) is placed into a small porous crucible called a cupel, and heated. The lead then becomes oxidised and is absorbed into the cupel, leaving a small silver/gold bead remaining in the cupel.

It now remains only to separate the silver from the gold. To do this, the bead is placed in a test tube and nitric acid is added, which, when the test tube is put in a hot water bath, dissolves the silver, leaving a small particle of pure gold.

If the particle of gold is large enough, it is usually weighed to determine the original grade of the sample. This is called a gravimetric finish to the fire assay. For lower grade samples with very small and difficult to handle gold particles the gold is dissolved in hydrochloric acid and the gold concentration is measured using AAS.



While Fire Assaying is normally done on a 1 Assay Tonne (roughly 30 gram) split of the pulverised material, a slight cost saving is to be found in selecting a smaller (15-gram) sample size. On the other hand, high-grade samples, for which there must be a gravimetric finish, are slightly more expensive than those that are read on the AAS.

In the analysis of platinum group elements, roughly the same procedure is followed, but the final element readings are normally done using ICP.

Assayers Canada Services Explained

Other Options for Gold Analysis

1. Cyanide Leaching

This method is often used for very sensitive analysis of bulk stream sediments or soils.

The entire sample is put into a cyanide solution and agitated for up to 24 hours, and the free gold in the sample is thus dissolved. The solution is then read on an AAS to determine the gold concentration of the original sample.

This method has the advantage of being able to detect small amounts of gold in large samples, and no additional sample preparation errors are introduced, since the entire sample is leached.

The disadvantage is mainly that the gold must be leachable by cyanide. Thus, it would not be effective in a situation where the gold is tied up in a pyrite matrix, as is the case in refractory ores. For this reason, it is normally recommended only for alluvial or well-oxidized samples.

2. Aqua Regia MIBK

This method is sometimes favoured over fire assay because there is a slight cost saving.

After normal sample preparation, a 10-gram split of the sample is dissolved in Aqua Regia. The gold is liberated from the other constituents of the solution with the addition of Methyl-isobutylketone (MIBK) and then read on the AAS.

While being a little bit less expensive than Fire Assaying, this method is not really recommended for gold analysis, because it is not effective in detecting refractory gold, and MIBK is a highly toxic chemical which raises difficult and largely unnecessary safety and environmental issues.

Assayers Canada Services Explained

Trace Level Geochemistry

There are three basic options available for analysing exploration samples for geochemical levels of most elements normally of interest to the exploration geologist. Geochemical samples (i.e. those not *normally* expected to have ore grade concentrations of critical elements) can be analysed either individually by a variety of traditional wet chemical techniques, or by multi-element ICP, or by Neutron Activation Analysis.

1. Traditional Wet Geochemistry

A wide variety of techniques are employed in traditional geochemical analysis, depending on the element being analysed.

Traditional geochemical analysis basically involves getting a sample into solution, and then using an appropriate method to read the element concentration in the solution. The sample is put into solution by dissolution with mineral acids. Depending on the element being analysed a fusion process may precede this. The type of acid used in the dissolving process is again dependent on the element being assayed. The solutions are then read by AAS, ICP or occasionally some other method.

2. ICP-AES Multi-Element Analysis

The sample is put into a test tube and treated with either Aqua Regia or a cocktail consisting of nitric-perchloric-hydrofluoric-hydrochloric acids, depending on the elements and the detection limits desired.

The beauty of ICP-AES multi-element analysis is the wide range of elements that can be read simultaneously. It is important, however, to be aware of the limitations of the method, the most serious being the fact that, depending on the sample mineralogy, not all elements that are analysed by ICP will invariably dissolve in the Aqua Regia or multi-acid digests. Thus, there is a chance that ICP will underestimate the concentrations of these elements. Another serious limitation to ICP is the fact that there can be interference between different elements. That is, the wavelength of one element's light emission will be close enough to that of another element to cause problems in reading the elements. This is particularly true if one of the elements has a very high concentration.

For the above reasons, ICP is not recommended for analyses that will be used in ore reserve calculations.

3. Instrumental Neutron Activation Analysis (INAA)

INAA has the very real advantage of not requiring the sample to be in solution (thus removing one step in the process, and eliminating any errors associated with that step), and of being able to measure many different elements, including gold, simultaneously.

One disadvantage of INAA is that many elements of interest (including copper and lead) cannot be analysed by the technique. Another disadvantage is the fact that this method requires a nuclear reactor, and there are few of these readily available in Canada.

The sample is prepared as normal and put into vials, which are then put into the reactor. Detection limits can be improved by using larger samples. This method is particularly good for analysis of panned concentrate samples, as it gives gold plus up to 34 different elements from one sample. Using a traditional fire assay (where, for panned concentrates, the entire sample is usually analysed), you can get only the concentration of gold in the sample.

Since Assayers Canada does not have direct access to a nuclear reactor, requests for INAA analysis are contracted out.

COMPARISON OF DIFFERENT TRACE ELEMENT ANALYSIS METHODS

Element	**Geochem**	**ICP AR**	**ICP MAD**	**INAA**
	(Range)	(Range)	(Range)	(DL)
Antimony	0.2-1000	5-10000	---	0.2
Aluminum	---	0.01-15%*	0.01-15%*	---
Arsenic	1-10000	5-10000	---	2
Barium	5-10000	10-10000*	10-10000*	100
Beryllium	2-1000	5-100*	0.5-100	---
Bismuth	0.1-1000	5-10000	5-10000	---
Boron	1-10000	---	---	---
Bromine	---	---	---	1
Calcium	---	0.01-15%*	0.01-15%	1%
Cadmium	0.1-200	1-100	1-100	---
Cerium	---	---	---	3
Cesium	---	---	---	2
Chlorine	---	---	---	100
Chromium	1-10000	1-10000*	1-10000	10
Cobalt	1-10000	1-10000	1-10000	5
Copper	1-10000	1-10000	1-10000	---
Copper Oxide	1-10000	---	---	---
Europium	---	---	---	0.2
Fluorine	10-10000	---	---	---
Gallium	5-10000 (ICP)	---	---	---
Germanium	5-1000 (ICP)	---	---	---
Gold	---	---	---	5 ppb
Hafnium	---	---	---	1
Iridium	---	---	---	5 ppb
Iron	10-10000	0.01-15%*	0.01-15%	0.02%

Lanthanum	---	---	---	1
Lead	1-10000	2-10000	2-10000	---
Lutetium	---	---	---	0.05
Magnesium	---	0.01-15%*	0.01-15%*	---
Manganese	5-10000	5-10000*	5-10000*	---
Mercury	5-50000 ppb	---	---	1
Molybdenum	1-1000	2-10000	2-10000	5
Neodymium	---	---	---	5
Nickel	1-10000	1-10000	1-10000	50
Niobium	10-10000 (ICP)	---	---	---
Phosphorous	10-10000 (ICP)	10-10000*	10-10000	---
Potassium	---	0.01-10%*	0.01-10%	---
Rubidium	---	---	---	30
Samarium	---	---	---	0.1
Scandium	---	1-10000	---	0.1
Selenium	1-100	---	---	5
Silver	0.1-200	0.2-200	0.2-200	5
Sodium	---	0.01-5%*	0.01-5%	0.05%
Strontium	1-10000 (ICP)	1-10000*	1-10000	0.05%
Tantalum	---	---	---	1
Tellurium	2-100	---	---	---
Terbium	---	---	---	0.5
Thallium	5-10000 ppb	---	---	---
Thorium	2-10000 (ICP)	---	---	0.5
Tin	2-1000	10-1000*	---	0.01%
Titanium	---	0.01-10*	0.01-10%	---
Tungsten	5-1000	10-10000*	10-10000	4
Uranium	---	---	---	0.5
Vanadium	5-10000	1-10000	1-10000	---
Ytterbium	---	---	---	0.2
Yttrium	---	1-10000	---	---
Zinc	1-10000	1-10000	1-10000	50
Zirconium	---	1-10000*	---	---

* Elements thus marked may not dissolve completely, or may experience some losses

Assayers Canada Services Explained

Ore Grade Analysis

The above techniques, subject to the limitations mentioned, give reasonably reliable analytical results in the detection ranges indicated. For higher grade samples, and in situations where additional confidence is required in the results (to be reported to the stock exchange, for example) traditional wet chemical techniques are recommended.

For trace level geochemical analyses, the recipe of getting the samples into solution which can be read by the instruments is standard, and does not make allowances for variations in the rock matrix or for the concentration of the element being analysed. As such, if the minerals present in the sample are not those usually encountered not all of it may dissolve, and the analysis may then be on the low side for certain elements. High grade samples, when put into solution using a standard trace level recipe, may result in solutions which have greater concentrations of the elements of interest than the instrument can reliably read. In this case, they would be reported simply as "greater than the maximum value for the technique".

Depending on which elements are being analysed, the methods for ore grade analysis may not differ greatly from those for trace elements. If an ore grade analysis is requested, however, the sample is dissolved using solvents that more vigorously attack it, (thus ensuring that all of that element is in solution) and the solution is then diluted so that concentration of the element is within the range of the instrument on which it will be read.

This attention to detail results in the higher cost of the ore grade analysis.