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DIAMOND DRILLING REPORT  
on the  
SAM GROUP OF CLAIMS

KAMLOOPS MINING DIVISION

NTS 82M/4W

Lat 51°08'N Long 119°49'W

Operator:

Minnova Inc.  
3-311 Water Street.  
Vancouver, B.C.  
V6B 1B8

**GEOLOGICAL BRANCH**  
**ASSESSMENT REPORT**

Alan R. Hill  
February, 1991.

20,984

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## INTRODUCTION

The Sam Group of claims encompasses some 2000 hectares of rolling highlands on the Adams Plateau, including the northern flanks of Samatosum Mountain and parts of the Johnson Creek valley, about 30 km east of Barriere, B.C. The property includes the Samatosum Mine, which began extracting polymetallic ore in June 1989, from a deposit with reserves estimated at 634,984 tonnes grading 1035g/t Ag, 1.2% Cu, 1.7% Pb, 3.6% Zn, 1.9 g/t Au.

This report summarizes the results of three diamond drill holes, RG391 to RG393, drilled in the fall of 1990, which fulfill the exploration requirements to keep the mineral claims in good standing as shown in Table 1.

## LOCATION AND ACCESS

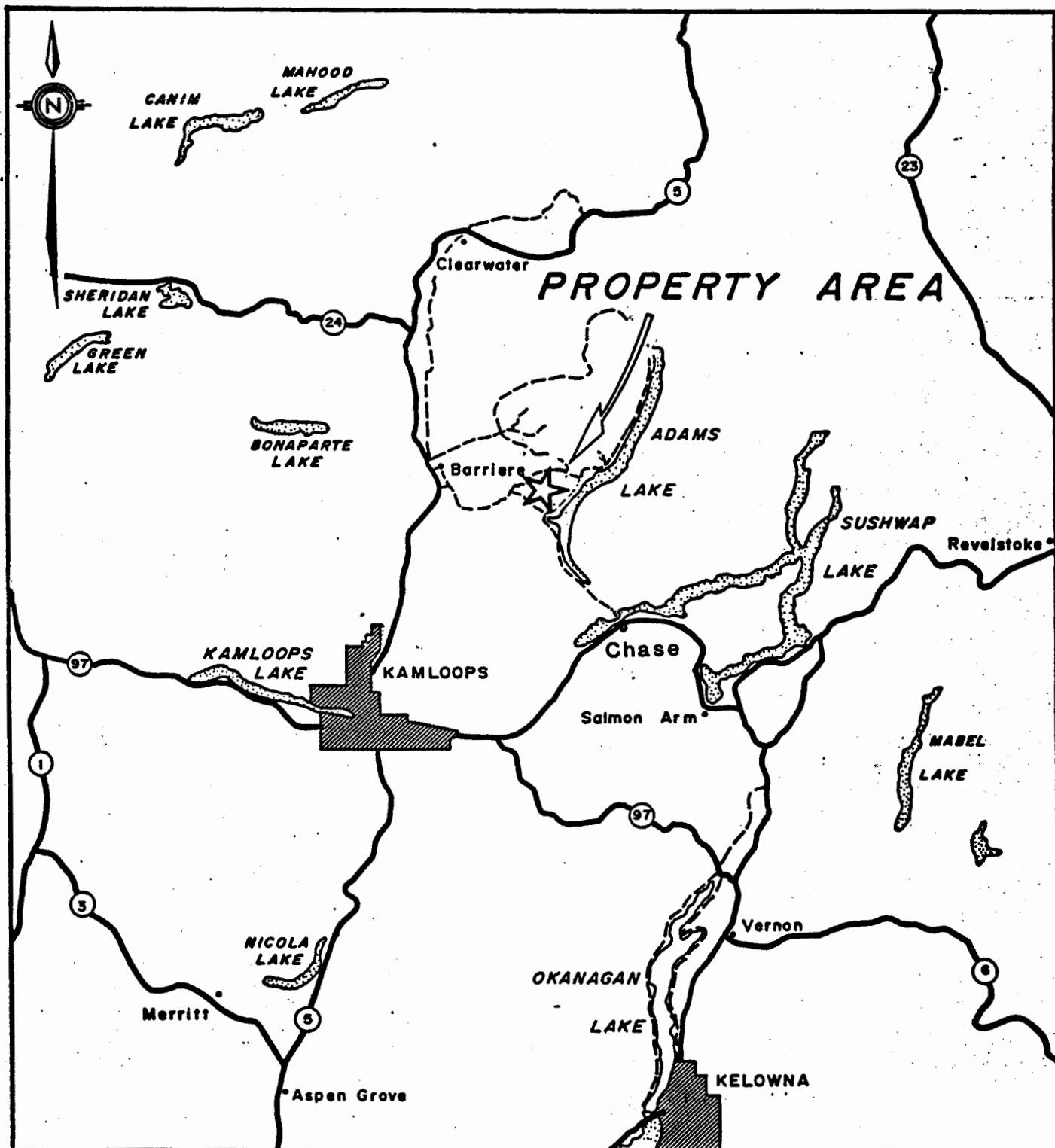
Located approximately 100 km northeast of Kamloops, the Sam property is easily accessible by highways and good quality gravel roads. Forest service access roads cross near the centre of the property (fig.1) and provide routes from both the west and southeast.

The town of Barriere (pop. 2000) lies 30 km to the west on the Yellowhead highway, and can provide all necessary services. Alternatively, the town of Chase is 45 km to the south of the property, on the Trans-Canada highway.

## TOPOGRAPHY, CLIMATE, AND VEGETATION

Physiographically, the claim area lies within the Adams Plateau, an area typified by well forested, rolling mountain terrain. Elevations on the property range from approximately 1100m at Johnson Lake to 1400m at the peak of Samatosum Mountain.

The climate is moderate with temperatures ranging from extremes of -25 degrees Celsius in winter to 30 degrees Celsius in the summer. Precipitation is semi-arid to moderate, with a snow free period from May to November.



# SAM GROUP LOCATION MAP

FIGURE 1

Vegetation on the property consists of stands of balsam, fir, pine, cottonwood, birch and cedar. The claim area has been extensively clear-cut by logging companies, and is currently part of the summer range for cattle from ranches in the Sinmax Valley to the south.

### PROPERTY

The ownership of the Sam Group of claims is part of a joint venture agreement with Rea Gold Corporation ( Minnova 70%, Rea Gold 30% ), where Minnova Inc. is the operator. The claim group consists of a Mining Lease, and ten claims as shown below in Table 1 and in Figure 2. The drilling was carried out on the mining lease exclusively.

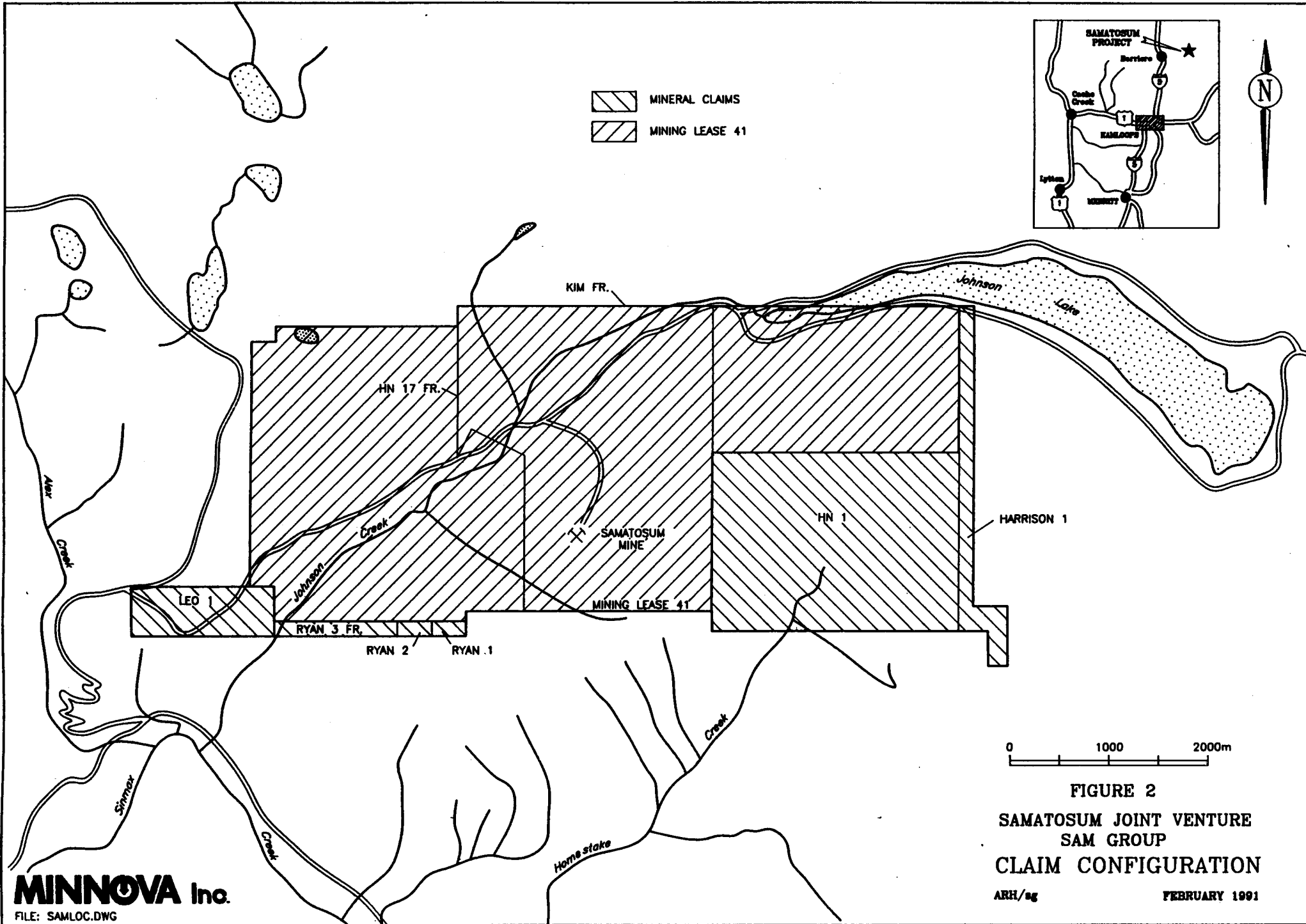
TABLE 1. SAM GROUP OF CLAIMS



<u>CLAIM</u>	<u>REC #</u>	<u>UNITS</u>	<u>CURRENT EXP.DATE</u>	<u>NEW EXP.DATE</u>
HARRISON 1	8011	8	09/06/93	09/06/2000
HN-1	4802	20	10/07/92	10/07/1994
HN-12 Fr.	5031	1	11/22/92	11/22/2000
HN-17 Fr.	5036	1	11/22/92	11/22/2000
HN-19 Fr.	5038	1	11/22/92	11/22/2000
LEO 1	7931	4	07/28/93	07/28/2000
RYAN 3 Fr.	7957	1	08/12/93	08/12/2000
RYAN 1	7958	1	08/12/93	08/12/2000
RYAN 2	7959	1	08/12/93	08/12/2000
KIM Fr.	7961	1	08/12/00	same
Mine Lease #41		1*	10/03/2019	(30 yr. lease)

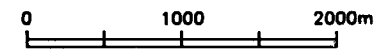
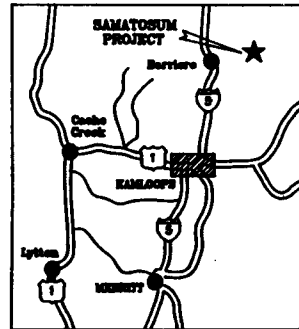
\*Considered one unit for grouping purposes.

### HISTORY

The Adams Plateau on the west side of Adams Lake has received intermittent exploration activity since the 1920's, due to the presence of several large rusty rock exposures and numerous small base and precious metal occurrences. Only the



-  MINERAL CLAIMS
-  MINING LEASE 41



**FIGURE 2**  
**SAMATOSUM JOINT VENTURE**  
**SAM GROUP**  
**CLAIM CONFIGURATION**

ARH/sg

FEBRUARY 1991

Homestake Mine, in the Sinmax Valley, reported minor production prior to the discoveries on Mt. Samatosum.

In 1983, Mr. Al Hilton of Kamloops located and staked a hematitic gossan that had been recently uncovered by active logging on the NW flank of Mt. Samatosum. He had been drawn to the area by anomalous soil and silt samples collected during a two year prospecting program utilizing a field geochemical kit. Trenching revealed the presence of gold-bearing massive sulphides, which would become known as the Discovery Zone. The Sam property was optioned by Rea Gold Corporation who in turn optioned it to Minnova Inc. (then named Corporation Falconbridge Copper). Exploration drilling outlined a total of three small, metallurgically difficult massive sulphide pods containing significant amounts of gold. Sub-economic reserves were estimated at approximately 150,000 tonnes of of arsenical mineralization grading 7.2 g/t Au, 85.7 g/t Ag, 0.6% Cu, 2.5% Pb, and 2.6% Zn. Exploration of other targets on the property by Minnova Inc., utilizing geochemistry, geophysics, and sound geological thinking, led to the 1986 discovery of the "Sam Deposit" by diamond drilling. Geological reserves were calculated at 634,984 tonnes containing 1035 g/t Ag, 1.9 g/t Au, 1.2 % Cu, 1.7% Pb, 3.6% Zn. Production began in June, 1989, from a small open pit at a rate of about 450 tonnes per day.

Exploration has since been ongoing on the mine property (Sam Group), primarily in the form of diamond drilling.

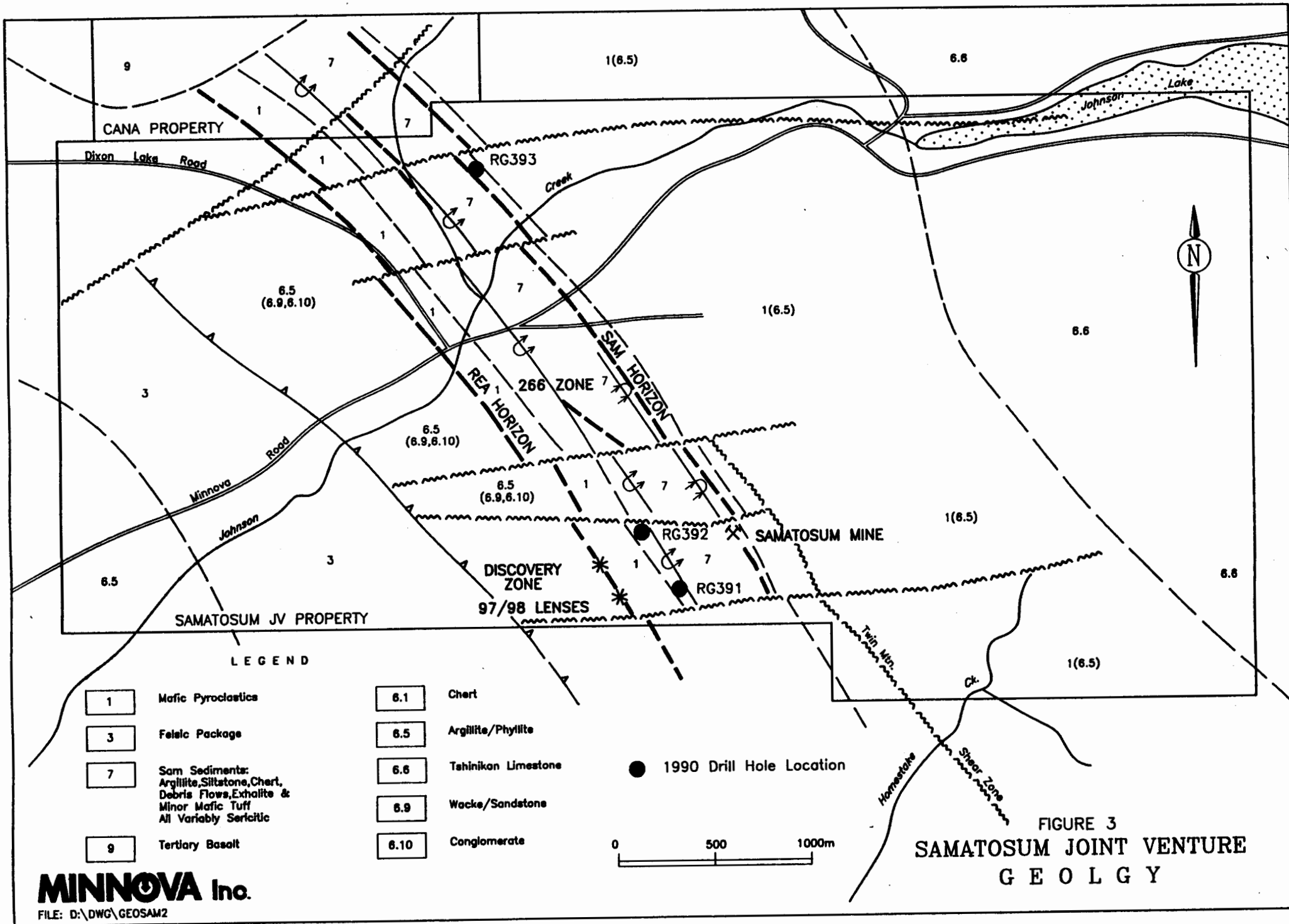
## REGIONAL GEOLOGY

The area comprises a package of structurally complex low-grade metamorphic rocks which lie along the western margin of the Omineca Belt. The package is flanked to the east by the high-grade metamorphic rocks of the Shuswap Complex and to the west by rocks of the Intermontaine Belt. It includes an assemblage of metavolcanic and metasedimentary rocks of the Paleozoic (Cambrian to Mississippian) Eagle Bay Assemblage. These have undergone several phases of deformation involving folding and thrust faulting, and producing a moderate to strong foliation in most of the units. Deformation generally increases eastward towards the margin of the Shuswap Complex. To the north the Eagle Bay Assemblage is intruded by granite and quartz monzonite of the Cretaceous Baldy Batholith.

## PROPERTY GEOLOGY

The Sam property is entirely underlain by Eagle Bay rocks. They consist of principally northwest trending, northeast dipping rock-type assemblages of: limestone marble, mafic volcanics, mixed cherty argillaceous sediments (including debris flows and exhalative horizons), black distal turbidites, and felsic volcanics. The rocks display a strong NW regional axial planar foliation (dip  $55^{\circ}$  E) with tight overturned folding and accompanying thrust faulting. The Samatosum sulphide deposit sits at a particular horizon in cherty mixed sediments near a major volcanic-sedimentary break. This "Sam Horizon", although highly





**MINNOVA Inc.**

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deformed, can be traced across the entire property. The Discovery Zone ("Rea Deposit") sits in a similiar package of rocks some 500 metres to the southwest of the Sam Deposit and can also be traced out across the property. Mineralogically the two deposits are very different with Sam dominated by coarse grained tetrahedrite, sphalerite, galena, chalcopyrite and quartz while Rea is dominated by fine grained arsenopyrite, pyrite, sphalerite, galena, quartz and barite. The relationship between the two deposits remains uncertain, but the stratigraphic setting has led variously to speculation that the two deposits sit on structural repetitions of the same horizon and are correlative, or rather they represent the stacking of deposits from different levels in a changing and long-lived hydrothermal system.

#### DIAMOND DRILLING

In late September of 1990 three holes were diamond drilled to test favourable stratigraphy in previously untested areas. The detailed logs for drillholes RG391, RG392, and RG393 appear in appendix 1, and they are plotted in cross-section in figures 4, 5, and 6. The results are discussed below.

#### DDH RG391 - RESULTS

Hole RG391 was drilled to test the Rea Horizon on section 96+50W at a depth of 260 metres below surface. The hole collared in mixed cherty argillaceous sediments displaying tectonic brecciation and disharmonic small scale folding attributable to a brittle-ductile fault structure, probably a thrust, which

culminates with 2.3m of friable graphitic gouge (from 75.5 - 77.8 m). Once past the fault, the hole encountered a thick pile of ferrodolomitized mafic volcanics, with subordinate amounts of silty argillaceous interflow sediments. From 265.7 - 273.3 the amount of pyrite increased from trace levels to 15% with associated silicification and sericitization of the mafics. The target stratigraphy followed and consisted of thinly bedded "ribbon" chert and cherty argillite that was highly deformed, and contained 5-7% disseminated and fracture filling pyrite. Base metal sulphides were present only in crosscutting quartz stringers, and assayed .15% Cu, 1.2% Zn, 1.2% Pb, 12.8 g/t Ag, .45 g/t Au over 2.5m (286.9 - 289.4m). The hole then proceeded through relatively barren intermediate pyroclastics, argillite, and lithic wacke to a final depth of 488.9 metres.

#### RG392 - RESULTS

Hole RG392 was drilled on line 100+50W to intersect the Rea Horizon at a depth of 225 metres below surface. The hole also collared in graphitic breccia interpreted to be the same thrust fault, followed by a thick interval of ferrodolomitized mafics (80.5 - 221.8 m). The target stratigraphy followed conformably and consisted of weakly pyritic chert and argillite, with some of the pyrite occurring in thin laminations. Assaying returned no significant values in base or precious metals. The hole continued through weakly silicified and brecciated lithic wacke, argillite, and siltstone to a final depth of 371.2m. Some of these mixed

sediments were also suspected to contain a tuffaceous component, based on colour and patchy carbonatization. Slightly elevated levels in arsenic and gold at a geochemical level were attributable to the alteration associated with fault brecciation.

#### RG393 - RESULTS

This hole targeted a different package of rocks than the previous two holes. It was drilled on line 12100W to intersect the "Sam Horizon" in the northwest portion of the property. The hole collared in relatively undeformed laminated distal turbidites which gradationally gave way to coarser arenaceous to conglomeratic rocks downhole. At the 82.5m mark carbonatized mafic volcanics were encountered, and this lithology continued to 130.0m. Light grey chert and argillite, in highly deformed and brecciated textures followed, and hosted 10% white quartz-carbonate veins. This was thought to represent the Sam Horizon. One of these veins contained 5% sphalerite, minor galena and chalcopryrite, and trace amounts of tetrahedrite. Assays returned from this interval (139.8 - 140.6m) were .19% Cu, 1.61% Zn, .65% Pb, 55.7g/t Ag, and 1.39g/t Au over 0.8m. More carbonatized mafics followed from 172.4 - 198.2m, and 231.9 - 247.1m alternating with intervals of mixed sediments containing 5-10% disseminated pyrite. The only significant intersection was again associated with quartz-carbonate flooding (227.4 - 227.9m) and assayed .833% Cu, 1.14% Zn, .24% Pb, 69.7g/t Ag, and 1.64g/t Au. The hole ended at 261.2 metres.

### CONCLUSIONS AND RECOMMENDATIONS

None of the three holes, RG391-RG393, encountered economic mineralization, but two of them did intersect significant polymetallic grades over narrow widths, while the other (RG392) encountered geochemically anomalous levels in arsenic and gold. The targeted horizons, namely the Sam and Rea, were found to be recognizable even in the presence of intense deformation. Indeed sufficient evidence exists to suggest that a hydrothermal system was once active and extended to include the vicinity of the three holes. Exhalative rocks were scarce, however, and represented only by minor ribbon cherts, and thin pyrite laminae, indicative of a distal environment.

It should be noted that the three holes discussed above are part of an ongoing drill program, expected to continue through the life of the Samatosum mine. Further drillholes are recommended on both the Sam and Rea horizons, both up and down dip, as well as along strike. It is hoped that this will enable trends to be delineated, which could lead to the discovery of new centres of mineralization, and hopefully add to the reserves currently being mined on the property.

APPENDIX I  
STATEMENT OF COSTS

STATEMENT OF COSTS

up to Oct.7    post Oct.7

DIAMOND DRILLING

Direct Drilling Costs (1121.3m @ \$77/m)  
 (Frontier Drilling Ltd.)..... \$86,340.10

ANALYTICAL COSTS

Min-En Labs, North Vancouver, B.C:  
 (155 Assays @ \$19.07/sample)..... \$2,955.61

PERSONNEL

A. Hill - Project Geologist  
 Sept 18-Oct 7 (20 days @ \$200/day)..... \$4000  
 Oct 8-Oct 15 (8 days @ \$200/day)..... \$1600

A. French - Geologist  
 Sept 18-Oct 7 (20 days @ \$150/day)..... \$3000  
 Oct 8-Oct 15 (8 days @ \$150/day)..... \$1200

S. Fraser - Field Technician  
 Sept 18-Oct 7 (20 days @ \$100/day).....\$2000  
 Oct 8-Oct 15 (8 days @ \$100/day)..... \$ 800

LOGISTICS

Vehicles:..... \$ 585                    \$ 360

Food and Accomodation:..... \$2400                    \$ 480

MISCELLANEOUS COSTS

Drafting, computer, supplies..... \$ 800

	_____	
A) TOTAL BEFORE OCT 7/90:	\$98,325.10	
B) TOTAL AFTER OCT 7/90:		\$8195.61

GRAND TOTAL (A+B) : \$106520.71

APPENDIX II  
DIAMOND DRILL LOGS AND  
ANALYTICAL RESULTS





HOLE NUMBER: RG391

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
0.00 TO 19.50	«CSG/WSTE DUMP»	Triconed through the waste dump. No return to sample and no recovery				
19.50 TO 21.80	«CHERT»	Colour: pale grey Grain Size: aphanitic Stylolitic argillaceous partings, in dense white to pale grey chert Core is broken, about 80% recovery Weak foliation/parting @	60	Hazy bordered qtz veinlets throughout, probably just sweets. Unit is a cherty argillite over last 15 cm and ends in a gouge	1% py as fracture fillings	Also traces of silver sericite on some fractures
21.80 TO 30.10	«SER/ARG FL T BX»	Colour: yellow, black Grain Size: fine Interval contains numerous fault gouges, and consists of yellow sericite and black argillite contorted bands cut by qtz veinlets and banding foliation	65	Yellow sericitic alteration of argillite and silt? assoc. with qtz veinlets and pre-faulting	3% wispy py	
30.10 TO 30.60	«QTZ/DOL VE IN»	Colour: white Grain Size: coarse Bully white vein with broken contacts, containing carbonaceous stylolites		Minor sil. of wallrock	Mostly barren except for 1% coarse brown sphalerite near upper contact	
30.60 TO 51.60	«ARG/CHT TE CT» "Tectonite"	Colour: white, grey, black Grain Size: fine Strongly flattened, boudined and brecciated black arg and grey chert in thin contorted beds or fragments. Flattening foliation becomes a spaced cleavage locally in "hinge zones" of cherty material	65	Minor silicification assoc. with widely spaced qtz veins {425-48.0} «str. flt. gouge»	2% diss. py.	

HOLE NUMBER: RG391

DRILL HOLE RECORD

LOGGED BY: A. HILL

PAGE: 2

HOLE NUMBER: R0391

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
51.60 TO 75.50	«YELLOW SER /ARG»	Colour: yellow, black, pale grey Grain Size: fine Compositionally banded yellow sericitic rocks, with a strong schistose fabric, locally displaying kink folding, boudin, and tectonic brecciation. Intensity increases downhole, along with friable  {65.8-75.5} «fault breccia»  Shearing/foliation	75	Selective alteration to yellow sericite schist of probable tuffaceous /volcaniclastic? interbeds. Patchy dolomitization also restricted to these beds. Widely spaced Qtz-dol veins up to 20 cm also present	2-3% py mostly dissem. in sericitic portions but also along margins of Qtz veins. Exception is:  {74.0-74.6} «7% py» -in strong schist	
75.50 TO 77.80	«GR. ARG FL T BX»	Colour: black and grey Grain Size: fine Friable, graphitic fault breccia, containing abundant broken Qtz-dol veinlets				?middle fault?
77.80 TO 104.90	«DOL MAFICS »	Colour: green, brown, black Grain Size: fine Although faulted, the upper contact contains thinly interbedded black argillite. Unit comprised of brown sericitic Fe-dol altered mafic pyroclastics? and flows. Intensity of fabric decreases downhole, where relict porphyritic (feldspar?) textures are visible, now replaced by carbonate  {85.8-86.3} «arg»  Interbed of argillite. A few ghosted lapilli visible downhole. Foliation	60	Intense Fe-dol with brown sericite after chlorite; Dol veinlets and segregations common	2% dissem. py	Ree mafics?
104.90 TO 144.20	«ARG/SILT TECT»	Colour: black and grey Grain Size: sphanitic to fine Conformable contact at thinly bedded argillite and siltstone, highly contorted and intraformally	65	Fe-dol alteration of more porous beds is moderate to intense. Dol-Qtz	1% fracture filling pyrite	

HOLE NUMBER: R0391

DRILL HOLE RECORD

LOGGED BY: A. HILL

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HOLE NUMBER: RG391

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		brecciated. Numerous hinge areas present where the foliation becomes a spaced cleavage almost perpendicular to bedding		veinlets from 1 cm to 10 cm are common and also deformed  130.9-144.2 -a coarse qtz-dol vein snakes in and out of the hole at low angles to c.s.		
144.20 TO 147.90	«DOL/MAF V-CLASTICS» "volcanic-clastics"	Colour: brown and grey Grain Size: Conformable knife sharp contacts expressed by change in alteration mineralogy. Faint banding possibly relict bedding?	60	Intense Fe-dol in patches surrounded by wispy brown sericite. Traces of talc.	3% dissem. py as alteration assemblage	
147.90 TO 151.00	«ARG/SILT TECT»	Colour: black and grey Grain Size: Interbed of similar material to 104.9-144.2 Sharp contacts marked by veinlets Cleavage	65	Dol veining flooding, hydro-breccia common	2% dissem. py	
151.00 TO 265.70	«DOL. MAF FLOWS»	Colour: green, grey, brown Grain Size: Monotonous pile of mafic volcanics with faint ghosted lapilli textures rare but pseudomorphed porphyry common. Probably blocky porphyritic flows. Mostly chloritic but intensely carbonatized. Sericite is pale green to brown in patches		Brown sericite development is only patchy, except for first 5 m which are moderately brown sericitic throughout Pervasive Fe-dol alteration through-out interval with numerous deformed veinlets	1-2% dissem. pyrite	See the series of lithogeochem samples
265.70 TO 267.90	«SIL/PY MAFICS»	Colour: olive green to brown Grain Size: Distinctive coloured, pyritic, silicified interval of mafics. Appears to be silicification overprinting typical brown sericitic to olive green dol mafics. Quartz occurs in a few bulky boudins but is mostly pervasive or in patches with coarse cataclastic hydrobrecciated pyrite		Brown to olive sericite overprinted by qtz flooding and pyrite. Qtz pyrite stringers, patches and boudins now semi-conformable to foliation. A few relict lapillia visible	15% coarse broken pyrite euhedra asso. with qtz flooding and veinlets. Also a small proportion of dense fine grained py assoc. with brown sericitic patches	

HOLE NUMBER: RG391

DRILL HOLE RECORD

LOGGED BY: A. HILL

PAGE: 4

HOLE NUMBER: R0391

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		Lower contact is marked by 1 cm of fault gouge Wavy foliation	70			
267.90 TO 273.30	«ARG/SER TUFF?»	Colour: black, brown, green, yellow Grain Size: fine Interbanded interval of black cherty argillite tectonite and mafic tuff? altered to sericite schist. Banding is on a 0.5-1.0 m scale Cleavage Lower contact marked by 2 cm fault gouge	75	Entire interval is silicified and cut by deformed thin qtz veinlets. The mafic tuff bands are variously brown, pale green or yellow sericitic  Proportions are 30% arg and 70% schist	2-3% py occurring as fine dissem. in the argillite and in kink-banded wisps within the sericite schist	
273.30 TO 289.80	«CHERT/CHTY ARG»	Colour: black and grey Grain Size: aphanitic Contorted and tectonically brecciated ribbon chert and lesser cherty argillite. Breccias are well-healed by silica. Local spaced cleavage From about 281 m to end of interval, a qtz stockwork is present that is well mineralized  280.6-281.4 -qtz stockwork with hazy borders has 3% aspy and 2% py  282.4-288.1 -a dense black cherty argillite hosts clearly crosscutting qtz veinlets at low angles to c.a. (10-30 deg) which are rich (10%) in py-sp-cp-asp and gn in decreasing order of abundance. Veinlets are 1 to 10 cm wide irregular and deformed	70	Silicification assoc. with stockwork veinlets and flooding	5% medium to coarse grained py fracture fillings with notable exceptions of mineralized qtz stockwork  {280.6-288.1} «qtz stk, 3% bn, tr. asp»  Best sample is from 286.9-288.1 where a rich veinlet snakes along the core axis with 5% sp, 5% py, 2% cp and tr. gn and aspy as coarse clotty sulphides	
289.80 TO 305.60	«SER/PY SILT?& ARG»	Colour: yellow and black Grain Size: Conformable contact with yellow sericite, pyrite, argillite schist. Strong fabric best expressed by wispy, stylolitic to kinked pyrite bands only a few mm wide. Argillite occurs as common bands and as a few angular clasts within sericite matrix.		Silicification assoc. within boudined qtz veinlets is patchy. Sericite is pervasive through all but the black argillaceous portions of the core. Qtz veins with trace aspy dominate the	7% py overall as wispy bands  {294.5-295.4} «10% py, 2% sp, 1% asp» -assoc. within qtz veining and flooding	Quite possibly the yellow sericitic alteration could be silty sediments

HOLE NUMBER: RG391

DRILL HOLE RECORD

LOGGED BY: A. Hill

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HOLE NUMBER: RG391

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		Relict fragmental texture visible but only locally		interval 300.0-300.8 {298.0-298.5} «flt. gou.+bx»		
305.60 TO 336.70	«ARG/LITHIC WACKE»	Colour: black and grey Grain Size: Dense, black, argillite, medium bedded with alternating sandy to conglomeratic lithic wacke Clast types include argillite, silt, wacke, chert, mafics, and py in decreasing order. Very conformable upper contact Bedding Top direction indeterminate 330.7-331.7 -contains minor yellow sericitic bands  {331.5-336.7} «flt. gou.+bx»  Grading and inverse grading present in wacke beds	60	Fresh to begin with, becomes weakly phyllitic at 316.0 m, in an envelope about a thick silicified wacke bed at 323.0-324.6. This envelope also contains elevated, finely disseminated pyrite	3% dissem. pyrite, except from 316-332 contains 5% py	Compare unaltered bimodal seds. to weakly "nutized" seds in two litho samples, respectively
336.70 TO 352.00	«DOL MAFICS »	Colour: brown and grey Grain Size: Strongly faulted upper contact with typical strongly dol mafics, probably pyroclastic flows Foliation is all over, but mostly at Conformable lower contact	60	Wispy brown sericite bent around grey dolomite patches	3% dissem. py except 350.8-352 which has 10% diss. py	
352.00 TO 356.20	«SIL ARG/CHT BX»	Colour: black and grey Grain Size: Very chaotic, intensely silicified interval of tectonic breccia, well healed except for:  {354.8-356.2} «flt. gou.+bx»  Probably some primary ribbon chert component, but alteration too intense to be sure		Intense silicification, with qtz veins from 354.3-354.8 and fragments in the flt gouge	10% fracture filling py with a couple of 1 cm "seams" possibly primary Tr. sphalerite	

HOLE NUMBER: RG391

DRILL HOLE RECORD

LOGGED BY: A. HILL

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HOLE NUMBER: RG391

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
356.20 TO 382.20	«INTERMED. TUFF?»	Colour: green grey Grain Size: Correlative lithology to that intersected in deep hole RG256. Clearly a pyroclastic interval with internal fragmental texture, but gradationally becomes a finely bedded ash and crystal tuff by 367 m. Bedding Foliation is parallel to bedding, warped and poorly developed. Feldspar (?) crystals are now replaced by carbonate. Quartz eyes are rare	70	Intense pervasive ferrodolomitization but brown sericite is notably absent. Pervasive sericite is pale green to grey and yellow	3% pyrite overall, occurring as disseminations and along thinly spaced bedding planes in the ash tuff	
382.20 TO 388.30	«QTZ DOL VE IN»	Colour: white Grain Size: coarse Milky white and completely barren of sulphides. Contacts are sharp, irregular, but roughly parallel to foliation		A few wallrock inclusions are strongly sericitic  {388.0-388.3} «FLT BX»		
388.30 TO 391.30	«SIL CHTY ARG»	Colour: grey and black Grain Size: fine Strongly silicified grey cherty rock with black argillaceous material and pyrite along connected fracture system. Gradational lower contact		Hazy bordered qtz veinlets and silica flooded patches, pervasive silicification	3% fracture filling pyrite	
391.30 TO 441.90	«INTERMED TUFF»	Colour: pale green Grain Size: Interval begins with qtz-dol veined, yellow to brown sericitic volcanics, but by 400.7 has gradationally become a monotonous pile of pale green "greenstone". Fine grained to aphanitic. No bedding or internal structures apparent. When stained a granular texture with Fe-calcareous grains in dol. matrix is visible.		Pervasive ferrodolomitization and minor bleaching along fractures. Internal textures largely "washed out" by alteration	tr. diss. py	

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FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
441.90 TO 453.70	«ARG»	Colour: black and green Grain Size: aphanitic Gradational interbedded contact with thinly bedded black argillite. Thin beds of above lithology occur throughout, but most commonly near upper and lower contacts. Bedding is warped and locally contorted but averages	60	Fe-dolomitic tuff interbeds	Disseminated pyrite euhedra up to 1 cm comprise 2% of interval	
453.70 TO 488.70	«INTERMED. TUFF/PYRO»	Colour: pale green to grey Grain Size: fine to med. Similar to 356.2-382.2, pyroclastic interval with wispy pyrite, pseudomorphed grains, etc. Foliation	60	Strong pervasive carbonitization pale green sericitization	Wispy fracture fillings and along bedding planes which parallel foliation 3% pyrite	{484.0-484.6} «arg. flt. bx»
488.70 TO 488.90	«ARG»  E.O.H.	Colour: black and grey Grain Size: Interbedded, gradational contact, as above				

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## GEOCHEM. SHEET

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Sample	From (m)	To (m)	Length (m)	SiO2 %	Al2O3 %	CaO %	MgO %	Na2O %	K2O %	Fe2O3 %	MnO2 %	TiO2 %	BA %	Zr %	Cu PPM	Zn PPM	Pb %	TOTAL %	Au PPB	BA PPM	AG PPM	PB PPM	P2O5 %	SR %	S %	TOTAL %	AS PPM	SB PPM	
27077	31.00	34.00	3.00	81.76	5.79	1.65	1.57	.01	0.01	3.97	.01	.32			49	63			10	111	0.7	43	.01		1.7	97.01	67	4	
27078	55.00	58.00	3.00	60.54	17.36	.50	2.04	.25	3.40	6.66	.25	.80			47	60			5	52	0.1	54	.27		0.79	93.14	31	1	
27083	90.50	93.50	3.00	35.92	11.95	14.18	7.04	1.65	0.55	10.43	1.65	1.22			88	64			5	16	2.5	39	.72		0.21	84.05	168	1	
27084	108.00	111.00	3.00	64.35	12.75	2.05	5.14	.25	2.37	5.91	.25	0.56			49	83			10	74	1.2	30	.65		0.17	94.37	74	1	
27086	114.00	117.00	3.00																										
27087	117.00	120.00	3.00																										
27085	151.00	154.00	3.00	37.17	11.79	10.50	8.23	.25	3.15	7.58	.25	1.53			63	70			5	58	2.4	18	.99		0.45	81.90	147	1	
27086	163.00	166.00	3.00	47.10	12.25	7.22	14.75	.85	0.64	9.84	.85	1.66			64	59			10	40	2.1	14	1.04		0.21	95.77	29	1	
27087	218.50	221.50	3.00	46.04	15.10	6.69	4.56	1.05	3.41	8.67	1.05	1.41			80	47			5	40	1.7	35	.57		4.73	92.47	41	5	
27088	261.00	264.00	3.00	37.08	12.70	10.87	8.60	1.26	2.34	9.92	1.26	1.20			104	73			10	31	2.1	40	.84		2.73	88.00	136	7	
27039	307.00	310.00	3.00	47.40	14.53	1.66	12.74	.11	1.58	8.71	.11	1.20			48	188			20	19	2.2	136	.79		4.08	92.94	39	1	
27040	316.00	319.00	3.00	52.58	15.02	1.01	7.62	.29	1.81	10	.29	1.03			33	69			25	47	0.9	94	.56		6.31	96.35	101	1	
27041	339.00	342.00	3.00	40.84	10.82	11.32	8.26	.11	2.42	9.10	.11	1.19			67	57			5	31	2.1	21	.70		2.61	87.69	127	4	
27047	371.00	374.00	3.00	57.27	17	4.30	2.31	2.54	2.59	6.49	2.54	.63			21	49			5	120	1.3	43	.20		2.68	96.24	52	2	
27048	388.30	391.30	3.00	80.15	8.72	0.51	0.96	.01	.01	4.69	.01	.51			29	17			10	70	0.6	31	.01		2.44	98.08	72	3	
27049	410.00	413.00	3.00	60.07	19	1.93	2.01	6.80	.01	5.02	6.80	.70			13	74			5	113	0.7	29	.01		0.20	95.95	42	1	
27050	469.00	472.00	3.00	61.38	17.59	2.32	2.12	.45	2.78	5.30	.45	.64			26	55			10	161	1.1	67	.01		3.19	96.13	97	3	

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FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
0.00 TO 64.00	«CSG/WASTE»					
64.00 TO 80.50	«CHT ARG TE CT»	Colour: grey, black Grain Size: fine Folded; stretched boudined interval of graphitic argillites and chert which have been intensely broken and brecciated by later faulting. Approx. 55% of core is brecciated. Grey white quartz dolomite veining and flooding occupies 5% by volume. Phyllitic foliation well developed in blocks of cht/arg parallel to compositional layering. Folded pyrite, argillite and chert from bullseye structure at 70.2		Cherts (and siltites) show moderate dolomitization due to QDV and flooding Intense graphitic alteration of argillite	5-10% of pyrite visible in remnant chert argillite blocks as 1-5 mm fine grained bands, disseminated grains and blebs	Friable core
80.50 TO 221.80	«DOL MAF VO LCS»	Colour: greyish, white-light green & brown-yellow Grain Size: The contact with the structurally overlying unit is faulted. The interval comprises a thick pile of altered mafic flows and volcanoclastics. Original textures are generally destroyed, with the exception of ghost lapilli are visible (eg at 93.0 m) and relict porphyritic flows can be interpreted eg dolomite pseudomorphs 119.7-121.5 Phyllitic foliation is consistent around angle {203.5-204.3} «QDV Maf Flt-Bx»	70	Intense ferro-dolomitization throughout the interval. Intense development of yellow brown sericite in laminae and bands parallel to foliation. Brown sericite and quartz dolomite show well developed compositional layering between 141.0-145.0. Quartz dolomite veining has lead to the local bleaching and silicification of the host rock eg. 99.7-101.6	Pyrite appears throughout the interval, distributed as bands and laminae parallel to foliation; disseminated grains and blebs and blebby aggregations. The latter is often associated with QDV, the range in pyrite concentration is approx. 1-20% Base metals occur in the bleached zone {99.7-101.61} «<0.5% Gn, 7% Py»	
221.80 TO 234.50	«SER CHT AR G»	Colour: yellow grey and black Grain Size: fine The interval is mainly sedimentary in conformable contact with the structurally overlying mafic volcanics. Black graphitic argillites, light and dark grey cherts, pale yellow sericite and patchy QDV are mixed, folded and foliated at angle to c.s. 40-80 deg. A minor interval of dol. mafic volcanics (tuff)		Pale yellow sericite is intermittently well developed as compositionally layers within the chert argillite mixed sediments	2-5% pyrite, locally 20% over 2-3 cm is distributed as diss. grains and blebs, and occasional bands and laminae	

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FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		is mixed with argillite between: 229.6-230.8 † «Dol Maf Arg»  The interval is intermittently faulted, with blocky broken core and 5-15 cm sections of breccia and gouge				
234.50 TO 244.50	«ARG CHT»	Colour: dark grey, black Grain Size: fine Laminated to deformed and faulted dark grey cherts and black graphitic argillites. The contact with the overlying sericitic unit is marked by a minor fault. The chert varies from a massive ribboned texture with thin (<1 mm) graphitic argillite partings, to a comparatively finely laminated chert (1-3 mm) with similar width graphitic argillite laminae. The latter breaks easily along bedding at angle to c.a. Locally chert laminae have been stretched and boudined		Quartz dolomite veining parallel to and crosscutting the compositional layering has locally bleached the cherts. QDV occupy 1-3% of the interval	1-3% pyrite is distributed in thin bands (<1mm) parallel to argillite laminae; as dusty bands following folds in black silicified cherty argillite and as occasional blebs associated with QDV	Laminated argillite and chert breaks easily into discs.
244.50 TO 268.90	«ARG QTZ SER»	Colour: grey, black, greenish yellow Grain Size: fine Minor faulted contact with the above unit. However argillite and minor chert do persist into the interval. Grey white patchy quartz and dolomite have rough compositional layering with pale greenish yellow sericite wisps and laminae 60-70 deg. The concentration of quartz dolomite flooding has locally formed patchy QDV up to 70 cm e.g. 266.5-267.2. Creamy white dolomite lathes crystals well developed. Cherty argillite (unaltered remnants) occupy approx. 5% of the interval		Intense development of pale greenish yellow sericite. Patchy spotted dolomitization and thin wispy flakes of brown sericite suggest a mafic component ‡252.5-254.6 † «DOL MAF VOLC?»	2-7% pyrite with up to 15% locally developed over 2-3 cm. Pyrite is distributed as laminae and bands (<1 mm - 4 mm) disseminated grains and blebs. The greater % pyrite occurs as blebby concentrations associated with patchy QDV	
268.90 TO 294.70	«ARG LITHIC WACKE»	Colour: greenish grey Grain Size: fine to coarse The contact with the overlying unit is conformable		Staining outlines locally well	Pyrite is very variable to its dis-	The lithology is similar to the

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FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		<p>The interval is dominated by greenish grey, angular to subrounded, sand to pebble size (debris flow), conglomerate/breccia. Black argillite (and minor siltite) are occasionally lithic wacke (conglomerate) is also transitional to a cherty/arg het. frag?/tectonite? interval with pyritic argillite matrix between 283.9-291.0</p> <p>The section from 268.9-273.8 shows downhole coarsening of the wacke from fine matrix and granule size clasts to fine matrix supported granule to pebble size clasts. The latter comprise flattened, elongate black argillite, subrounded, pale grey yellow siltstone, greyish chert and occasional rip-up clasts of fine pyrite</p>		<p>developed dolomite nodules within the wacke ranging from coarse sand to granule size.</p> <p>The sub-interval from 283.0-294.7 appears to silicified to a greater extent than the overlying wacke. This may be due to a greater primary chert component in the rock rather than secondary silicification</p>	<p>tribution throughout the interval. The green lithic wacke tends to be pyrite poor, with occasional patches of fine disseminated pyrite up to 7% over 2-10 cm. There is some increase in pyrite to the bottom of the interval particularly within the cherty/arg het frag/tect between {288.3-288.8} «10-15% Py» where it is concentrated in blebs</p>	"JOHNSON PYROCLASTICS"
294.70 TO 297.50	«WACKE PY A RG»	<p>Colour: dark brown, black grey Grain Size: fine</p> <p>The contact with the above is not clear however if there is discontinuity, it is minor. The interval comprises argillite, wacke? and pyritic argillite, with the latter dominating between 295.9-297.5 (57% of the interval). The pyritic argillite has been partly faulted and therefore is very friable. Quartz dolomite has invaded part of the fault and a drusy cavity is encrusted with euhedral pyrite. Clasts within the wacke have been flattened and stretched parallel to foliation</p>		<p>The wacke has been very weakly dolomitized. Graphitic alteration of argillite</p>	<p>The 50 cm section of wacke contains &lt;1% pyrite in local, patchy fine disseminations &amp; blebs. The pyritic argillite contain 20% pyrite as very fine "dusty" grains disseminated throughout the subinterval</p>	
297.50 TO 303.90	«SIL WACKE»	<p>Colour: greenish grey to grey Grain Size: fine, coarse</p> <p>Minor faulted contact represented by overlying broken graphitic argillite.</p> <p>The interval comprises whitish grey silicified wacke, (silicified after dolomitization) with flakey grey sericite laminae. Foliation is well developed at angle to c.s.</p> <p>Sericite encloses or wraps around the silicified fragments which have been stretched and boudined parallel to foliation</p> <p>The bottom 2-3 m from 301.6-303.9 is invaded by</p>	70	<p>Weak spotted to locally well developed dolomitization within the wacke sed. Silicification is moderate to intense but there is doubt as to whether all of the silicification is secondary alteration. Protolith may be cherty in part, cherty fragments?</p> <p>The bottom 2.3 m is intensely silicified owing to the quartz dolomite veining and flooding</p>	<p>2-3% pyrite is distributed throughout as patchy disseminations, bands (2-3 mm) and occasional blebs. Local concentration 7-10% occurs at 299.6 m</p> <p>Trace galena occurs in association with the QDV at {301.6-302.6} «Tr. Gn, 1% Py»</p>	

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FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		cross-cutting quartz dolomite veins The 20 cm section 303.7-303.9 comprises pyritic argillite		Intense sericitic alteration		
303.90 TO 305.40	«PY ARG WAC KE»	Colour: greyish brown Grain Size: fine to medium The upper and lower contacts of the interval are conformable, with the exception of 10 cm of graphitic argillite from 303.9-304.0 m the interval comprises a homogeneous pyritic greyish brown fine to medium grained, argillic sandy wacke. Minor coarse grains are also visible. Weak foliation is developed and grains tend to show flattening parallel to foliation at angle to c.s. 80-90 deg.				The pyrite content is difficult to estimate, but could be in range 15-20%. The density of the rock feels too low for the pyrite content to be greater. The pyrite is evenly distributed as very fine "dusty grains"
305.40 TO 315.20	«DOL SEDS P Y ARG»	Colour: brown grey, black Grain Size: fine to medium A mixed interval of black to brown pyritic arg to black "shiny" graphitic argillite, dark greyish brown pyritic wacke (arenite?) and lighter greyish dolomitic sediments (siltites and wackes) The lithologies are moderately faulted and somewhat tectonised. Folding, stretching and boudinage are exhibited. Compositional layering and foliation 70-80 deg.  Quartz dolomite veining occurs parallel to and cross cutting compositional layering but only occupies 1-2% of the interval		Dolomitization has preferentially altered non argillite lithologies with the exception of sericite. Staining outlines spotted dolomite alteration texture.  Grey sericite is well developed		7-12% pyrite is mainly concentrated as zones, bands laminae and wisps of fine "dusty grains". Coarser grained pyrite in blebs is associated with QDV and sections showing greater strain.
315.20 TO 331.30	«DOL SEDS»	Colour: grey Grain Size: fine to medium A minor (1 cm) zone of fault gouge marks the contact with the overlying unit. The interval is dominated by grey spotted, nodular, dolomitized sediments, probably of wacke origin 60-70 deg. Original textures are virtually destroyed in the zones of intense		Grey sericite is well developed forming the planes of foliation. Overall, intense dolomitization		Pyrite content has decreased in relation to the above unit. The dolomitization zones have less than 1% Py, whereas the argillite has bands (1-4 mm) contain up to 15% Py over 10 cm e.g. 325.0 m.

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FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		<p>dolomitization</p> <p>The dolomitized intervals are occasionally transitional and interbedded with black argillites. The latter sections combined occupy approx. 10% of the interval.</p> <p>A minor mafic volcanoclastic sub-interval occurs  {328.0-328.3} «MAF VOLC»</p> <p>evidenced by the characteristic dark yellow brown sericite. White QDV cross-cut foliation and occupy 2-3% of the interval</p>			Occasional blebs pyrite are associated with QDV. Similarly one 2 mm bleb of chalcopyrite at 324.7 m	Argillite intervals are quite friable due to faulting
331.30 TO 339.10	«SEDS QTZ V N FLT BX»	<p>Colour: white grey  Grain Size: fine to coarse</p> <p>Interval comprises white quartz dolomite veins, dolomitized sediments and graphitic argillite in ratio 55:20:25, which have been faulted to breccia and graphitic gouge.</p>		Intense graphitic alteration of arg. Non argillite sediments intensely dolomitized. Quartz breccia locally healed with quartz dolomite matrix	<1% pyrite occurs, unevenly distributed as coarse blebs associated with QDV fragments. Trace chalcopyrite in two blebs at 334.2 (blebs, 1-2 mm diameter)	The fault appears to have moved parallel to the foliation as evidenced by contact of gouge and foliated dolomitic sediments. (60 deg to c.a.)
339.10 TO 342.30	«ARG SILT W ACKE»	<p>Colour: black, grey  Grain Size: fine, medium</p> <p>Black fine grained argillite and minor grey siltite wacke interbeds are fractured and broken due to their proximity to the above major fault</p> <p>Minor QDV &lt;1%</p>		Porous, siltite and wacke preferentially dolomitized.	1% pyrite distributed as fine grained blebs in silicified and dolomitized siltite and wacke and bordering QDV contact with argillite	
342.30 TO 361.80	«ARG SILT W AKE QTZ VN»	<p>Colour: grey, black, white  Grain Size:</p> <p>Intensely quartz dolomite veined argillite siltite and wacke. The veining has locally altered the host rock to a green sericite and talc. The alteration is probably confined to the more porous siltite and wacke. QDV occur parallel to and crosscutting compositional layering, occasionally trending parallel to core axis</p>		Siltite and wacke interbeds dolomitized In addition to the sericite/talc contact alteration zones patchy dark green talc up to 30-40%, over 10 cm occurs in mixed argillite and quartz vein, giving a mixed black green and white coloured texture	1-2% pyrite occurs as coarse grained blebs and occasional euhedral crystals. Minor sections (2-3 cm) have 7-10% pyrite as fine to blebby patches and aggregations. A single chalcopyrite bleb (3 mm diameter) occurs on the edge of an argillite clast in QDV at 351.1 m.	

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FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		<p>From 342.5-343.4 the core is broken and blocky indicating fracturing and faulting</p> <p>From {345.5-349.0} «qtz-dol v» the sub-interval is entirely QDV (qtz&gt;dol in ratio 65:35). The orientation is difficult to determine as the upper and lower contacts are hazy. It appears parallel to foliation 40-50 deg.</p>			3 blebs of galena occur in quartz vein stylolites {361.7-361.8} «0.5% Gr»	
361.80 TO 367.10	«ARG SILT W ACKE»	<p>Colour: grey, black Grain Size: fine to coarse Bedded sequence of black argillites, grey fine grained siltites and dark grey black fine to coarse, sand and pebbly wacke. Granules and pebbles are oriented parallel to foliation. Two intervals of granule/pebble wacke, 23 cm and 80 cm width, occur at the following intervals 364.27-364.50 366.3-367.1 Crosscutting QDV occupy 1% of the interval</p>		Greater porosity, siltite and sandy wacke beds are moderately to intensely dolomitized and partly silicified	<1% pyrite as dispersed grains, blebs and patches. Blebbly aggregations and fine grained patches occur close to QDV	Rip-up clast of argillite in pebbly wacke at 364.3 suggests tops downhole
367.10 TO 371.20	«ARG SILT»  E.O.H.	<p>Colour: grey, black Grain Size: fine, medium Conformable interval to the overlying generally coarser grained unit. Banded to laminated black argillite and grey siltite to arenite. Siltite/arenite &gt; argillite in ration 55:45. Laminæ and bands show same deformation (stretching) parallel to compositional layering. Occasional crosscutting QDV are folded.</p>	80	Coarser grained lithologies dolomitized	<1% pyrite in patchy bands, blebs and occasional euhedral crystals	

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## ASSAY SHEET

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Sample	From (m)	To (m)	Length (m)	ASSAYS								GEOCHEMICAL											COMMENTS	
				CU %	ZN %	PB %	AG G/T	AU G/T	SB %	AS %	CU PPM	ZN PPM	PB PPM	S.G.	AG OZ/T	AU OZ/T	AS PPM	BA PPM	BA %	SB PPM	AG PPM	AU PPB		
27119	99.70	101.60	1.90	.012	.10	.11	4.6	.05				123	1020	1121			3	33			34	4.6	53	
27122	220.30	221.80	1.50	.009	.01	.02	2.0	.16				86	95	151			179	23			12	2.0	161	
27123	221.80	223.30	1.50									63	96	64			55	60			4	1.1	30	
27124	225.80	227.30	1.50									48	174	58			71	54			3	0.9	1	
27125	229.60	230.80	1.20									91	106	61			195	67			8	1.7	23	
27126	230.80	232.30	1.50									24	105	58			85	79			4	0.7	1	
27127	234.50	236.00	1.50									21	23	39			61	89			4	0.6	62	
27128	243.00	244.50	1.50									23	28	46			62	84			4	0.5	50	
27129	244.50	246.00	1.50									30	84	34			97	119			2	0.7	1	
27130	249.00	250.50	1.50									31	54	41			58	129			3	1.2	100	
27131	251.60	252.50	0.90									42	201	51			49	104			6	2.5	53	
27133	261.80	263.40	1.60									39	152	116			23	117			3	2.1	2	
27134	266.50	267.30	0.80									46	94	47			8	148			1	1.4	18	
27136	278.50	280.00	1.50									11	14	97			27	102			1	0.6	21	
27137	286.50	288.00	1.50	.004	.64	.16	2.0	.03				36	6395	1622			117	99			6	2.0	30	
27138	288.00	289.50	1.50	.003	.03	.02	0.9	.06				30	255	216			41	139			3	0.9	57	
27139	293.20	294.70	1.50	.003	.02	.01	1.3	.08				30	169	67			51	156			3	1.3	79	
27140	294.70	295.90	1.20	.005	.02	.01	1.6	.24				49	164	64			72	63			3	1.6	240	
27141	295.90	297.50	1.60	.005	.01	.01	1.3	.26				48	147	72			60	56			4	1.3	259	
27142	301.60	302.60	1.00	.003	.01	.01	3.2	.22				30	27	140			31	243			8	3.2	220	
27143	302.60	303.90	1.30	.002	.01	.01	2.5	.93				21	69	63			86	118			5	2.5	930	
27144	304.00	305.40	1.40	.067	.11	.08	9.6	.24				665	1101	782			325	56			109	9.6	241	
27145	305.40	306.90	1.50	.009	.03	.02	3.4	.49				89	308	162			259	125			19	3.4	486	
27146	306.90	308.40	1.50	.022	.07	.02	12.6	.11				220	726	223			194	54			55	12.6	107	
27148	311.40	313.00	1.60	.009	.02	.01	2.7	.12				85	203	136			139	123			9	2.7	123	
27149	313.08	315.20	2.12	.009	.03	.01	3.2	.02				85	312	135			148	140			12	3.2	21	
27150	326.70	325.60	-1.10	.007	.01	.01	0.9	.01				65	94	57			27	69			3	0.9	1	
27151	332.80	334.30	1.50									75	98	508			86	107			3	1.8	1	
27152	334.30	335.80	1.50									61	575	114			54	108			3	1.2	1	
27153	335.80	337.00	1.20									42	18	32			69	211			1	0.7	1	
27154	342.30	343.80	1.50									22	26	19			95	172			1	1.1	6	
27155	345.50	347.00	1.50									13	22	237			86	61			1	2.1	1	
27156	348.60	350.20	1.60									66	56	50			92	81			1	1.1	1	
27157	350.20	351.70	1.50									55	89	312			82	89			1	2.7	7	
27158	351.70	353.20	1.50									40	126	43			83	97			1	1.1	3	
27159	355.20	356.30	1.10									44	160	52			89	128			1	0.7	1	
27160	358.30	359.80	1.50									58	111	45			33	79			1	1.1	1	
27161	359.80	361.30	1.50									24	53	34			72	58			1	1.2	1	

HOLE NUMBER: RG392

ASSAY SHEET

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HOLE NUMBER: RG392

ASSAY SHEET

DATE: 29-October-1990

Sample	From (m)	To (m)	Length (m)	CU %	ZN %	PB %	AG G/T	AU G/T	SB %	AS %	CU PPM	ZN PPM	PB PPM	S.G.	AG OZ/T	AU OZ/T	AS PPM	BA PPM	BA %	SB PPM	AG PPM	AU PPB		
27163	361.80	363.40	1.60								22	66	24				59	108		1	1.1	1		

HOLE NUMBER: RG392

## GEOCHEM. SHEET

DATE: 29-October-1990

Sample	From (m)	To (m)	Length (m)	SI02 %	AL2O3 %	CAO %	MGO %	NA2O %	K2O %	FE2O3 %	MNO2 %	TIO2 %	BA %	ZR %	CU PPM	ZN PPM	PB %	TOTAL %	AU PPB	BA PPM	AG PPM	PB PPM	P2O5 %	SR %	S %	TOTAL %	AS PPM	SB PPM
27118	80.50	83.50	3.00	42.48	12.44	6.54	11.81	.01	.98	10.02	.20	1.46			128	157			10	37	2.3	163					54	2
27120	141.10	144.10	3.00	42.37	16.74	5.89	3.84	3.19	2.05	9.27	.24	1.50			79	50			5	22	1.8	43					53	6
27121	207.60	210.60	3.00	42.23	13.57	7.93	7.04	1.38	1.80	9.05	.38	1.54			92	60			5	23	1.9	25					43	5
27132	258.20	261.20	3.00	52.39	17.47	1.66	6.14	.50	2.98	7.98	.13	.79			77	92			5	157	1.0	21					61	1
27135	270.40	273.40	3.00	48.71	17.66	3.64	7.19	.51	1.98	9.85	.03	1.25			62	64			5	170	1.7	40					1	1
27147	308.40	311.40	3.00	51.08	18.05	2.27	1.87	1.06	3.85	9.34	.06	1.11			122	376			330	66	7.2	218					189	26
27162	361.30	361.80	0.50	78.22	3.13	4.44	1.80	.35	1.13	3.70	.12	0.16			34	85			5	67	2.0	494					82	2
27164	364.00	367.10	3.10	71.00	9.54	3.18	2.11	.37	2.77	3.92	.05	0.46			19	51			5	76	1.0	31					70	2

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GEOCHEM. SHEET

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HOLE NUMBER: RG393

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
0.00 TO 33.50	«CSG»					
33.50 TO 45.40	«SILT ARG W ACKE»	<p>Colour: grey, black Grain Size: fine to medium Grey and black laminated argillite, siltite and fine to medium grained sandy wacke. Laminae and bands are variable in width: argillite 1 mm - 8 cm and siltite/wacke 1 mm - 20 cm. 75-80 deg Cleavage weakly developed at 20-25 deg</p> <p>The upper 3-4 m of the interval, 33.5-37.5 show minor deformation, stretching of siltite and distortion of bedding. The section 33.7-33.9 is very deformed and partly silicified, probably due to quartz vein injection. Intermittent sections of broken core and fault gouge. A minor fault marks the contact with the underlying interval but overall the lithology is gradational</p>		Siltite and wacke interbeds are preferentially dolomitized owing to their greater porosity	Trace pyrite, except for deformed section 33.7-33.9 where large blebs (5x7 mm) developed in QDV	Core breaks easily along foliated/ bedding surfaces
45.40 TO 50.20	«LITHIC WAC KE»	<p>Colour: grey, black Grain Size: fine to coarse Repetative sequence of lithic wacke (conglomerate/ breccia) and fine to coarse sandy wacke. Sections are akin to a heterolithic fragmental. Clasts tend to be flattened and oriented parallel to bedding and weak phyllitic foliation. Clastic fragments comprise quartz, dolomite argillite and yellow sericitized siltites?</p>	80	Light coloured silty and sandy grains and clasts show weak to moderate dolomitization	3-10% pyrite is disseminated throughout as fine cubic grains. The greater abundance occurs in the sandy sub-intervals eg. 46.9-47.2; 48.5-48.9	
50.20 TO 58.90	«AREN ARG»	<p>Colour: black Grain Size: fine The contact with the overlying unit is faulted parallel to foliation 80-90 deg. Black, graphitic silty argillite and black graphitic fine grained, well sorted arenite. The sandy beds are a fine mixture of white dolomitic grains in a black graphitic argillite matrix.</p>		The sand intervals have been preferentially dolomitized with alteration of non argillite lithologies Dolomitization weak to moderate, suggesting grains are partly siliceous.	3-5% pyrite overall with argillite hosting the greater %. Pyrite is distributed mainly as bands (1-10 mm) within the argillite. Fine disseminated pyrite occurs in some sandy beds	

HOLE NUMBER: RG393

DRILL HOLE RECORD

LOGGED BY: A. G. French

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HOLE NUMBER: R8393

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		Black, dolomitic arenite occupies approx. 35% of the interval with the principle sub-interval 52.0-54.9. Intermittent faulting represented by broken core and graphitic gouge		Dolomite also occurs as concentric nodular growths (1-2 mm)		
58.90 TO TO 69.20	«ARG DOL AR ENTITE»	Colour: grey, black Grain Size: fine, medium Lithologically similar to the overlying unit but the interval is characterized by a greater % of dolomitized grey arenite. (to 50%). Intermittent fault gouge and breccia, with main zones as follows:   63.4-64.2  «Flt Gou/Bk»  66.8-67.3  «Flt Gou»	70	Nodular dolomitic growths are abundant in the sub interval 58.9-61.9, av. 40% by volume. The conc. may be related to a vein-like structure at 60.8-60.9	Pyrite occurs as folded bands in argillite (1-4 mm) occasional blebs associated with dolomite (qtz) patches, and fine grained disseminations. Overall 3-5% pyrite	
69.20 TO TO 80.00	«SIL SEDS C HT»	Colour: grey, black Grain Size: fine The contact with the overlying sediments is faulted but there is no immediate variation in lithology. The change appears gradational. The interval comprises silicified grey, fine grained arenite/siltite; black, pyritic argillite and grey chert with fine black argillite partings (<1 mm) The lithologies tend to be gradational with the exception of the pyritic argillite between 70.9-72.1 m. The cherts (+ silicified siltite?) dominate the lower part of the interval from 76.2-80.0 and are gradational with the underlying het frag. Bedding is poorly defined but weak phyllitic foliation is developed at 70-80 deg. Faulting is confined to the upper 0.8 m of the interval 69.2-70.0 (strained sediments and graphitic gouge)		Silicification increases downhole, due to primary chert rather than secondary silicification	Pyrite generally occurs as fine grained bands and patches with occasional coarse grained blebs. Overall 2-7% pyrite with concentration within black argillite  70.9-72.1  «7-10% Py»  Several blebs (1-2 mm) of sphalerite occur over 10 cm at  75.6-75.7  «1% Sp» associated with minor patchy quartz dolomite	
80.00 TO TO 82.50	«HET FRAG»	Colour: grey, white, black Grain Size: fine to coarse Grey, black, chert, quartz dolomite, granules to		Locally silicified	7-10% pyrite occurs as fine "dusty"	

HOLE NUMBER: RG393

DRILL HOLE RECORD

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HOLE NUMBER: Rg393

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		pebble size, subrounded to subangular clasts form a heterolithic fragmental. The Met frag varies from clast, to argillite matrix supported			disseminations in irregular patches, coarser grains in blebs and occasional cubic crystals	
82.50 TO 124.60	«DOL MAF»	<p>Colour: grey to greenish yellow and brown Grain Size: Although a 2-3 cm interval of fault gouge marks the contact with the Met frag. The lithologies appear gradational. The mafic interval has been intensely altered, such that no relict textures are visible. Greyish white quartz and dolomite with yellow brown sericite and green talc form a generally chaotic mixture of lithologies. Folded, mottled grey white QDV crosscut foliation.</p> <p>Faulting is concentrated towards the lower contact as follows: 108.0-108.2 116.0-117.9 blocky, broken core and gouge The lower sub interval from approx. 119.0-124.6 appears strained with generally friable core. The contact with the underlying interval appears lithologically gradational</p>		Yellow brown sericite alteration forms patches and lamellae with foliation developed at 70-80 deg to c.a. Green talc and fuchsite are often associated with the zones of sericite alteration Intense dolomitization	Pyrite content decreases downhole from 7-10% near the Met frag. contact to 1-2% at the lower contact. Pyrite occurs as fine disseminations in patches, fine grains parallel to sericite laminae and disseminated fine grains and occasional blebs	
124.60 TO 130.00	«MAF VOLC ARG»	<p>Colour: light to dark grey and black Grain Size: fine Transitional interval comprising dolomitized mafic volcanics and black argillite Interval shows deformation with stretching parallel to foliation and folding of cross-cutting QDV. Faulted contact with underlying argillites and cherts</p>		Weak to moderate development of yellow brown sericite as fine laminae (< 1mm) Green talc and fuchsite well developed adjacent to fault at 130.0 m. Mod. to intense dolomitization of volcanic component	<1% disseminated pyrite	
130.00 TO 172.40	«ARG CRT»	<p>Colour: light to dark grey, and black Grain Size: fine Interval dominated by light to dark grey cherts with graphitic argillite partings (&lt;1 mm) and argillite interbeds (1-10 cm).</p>		A minor interval of quartz and pale yellow sericite occurs between 138.1-138.6	Overall the interval is relatively pyrite poor with est. 1-4% py. However locally pyrite and base metal sulphides	

HOLE NUMBER: Rg393

DRILL HOLE RECORD

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HOLE NUMBER: R6393

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		<p>The lithologies are generally deformed and faulted.</p> <p>The upper sub-interval 130.0-142.5 exhibits tectonised texture and structure with folded stretched and boudined argillite and chert Ribbon cherts are well developed from 142.5-148.0 152.6-158.6 and 168.0-171.6</p> <p>Quartz dolomite veining and flooding appears as more than one phase of intrusion but overall is estimated at 10% of the interval</p> <p>Faulting has resulted in up to 25% of the interval being broken and brecciated. The more significant zones are as follows: 140.6-142.3: 148.2-150.7: blocky 162.0-163.4: blocky 166.4-168.0: gouge+blocks The lower contact with dolomitized mafics is faulted, with 30 cm of gouge and infilling QDV</p>		<p>Chert appears to have been locally bleached by QDV at 145.0 m and 159.0. Quartz dolomite veining and flooding has also caused local silicification of argillite interbeds</p>	<p>of greater conc. do occur.</p> <p>{139.8-140.6} ~5% Sp, &lt;1% Gn Cp, Tr It and 8% pyrite. Sugary brown irregular blebs of sphalerite have intimately associated grains and small blebs (1-2 mm) galena and tetrahedrite. Chalcopyrite is associated with blebby aggregations of pyrite. All occur within an irregular folded patchy grey white QDV which crosscuts foliation and essentially floods the host arg and chert</p> <p>3% combined Sp, Gn, Cp (tr. Tt?) occur in a white QDV between 141.1-141.2, yellow-green arsenic? staining occurs in faulted, broken QDV + Arg/Cht at 162.5</p> <p>Pyrite is locally concentrated in patchy QDV + Arg/Cht at {166.4-167.4} ~20-30% Py as fine grained semi-massive bands and coarse cubic aggregations</p>	<p>Graphitic argillite and chert provides the right host rock chemistry for the precipitation of BMS <i>from</i> silica rich fluids</p>
172.40 TO 198.20	«DOL MAF VO LC»	<p>Colour: brown to grey Grain Size: Intensely altered mafic volcanics. No remnant textures visible. Texture is characteristically called a whitish grey to grey and yellow brown patchy mixture with locally well developed mottled grey and white dolomite zones</p>		<p>Intense dolomitization throughout and locally well developed yellow brown sericite alteration Fuchsita and green talc occur in close association with sericite particularly in zones of faulting</p>	<p>Trace to 4% pyrite</p>	
198.20 TO 209.40	«MAF ARG CHT FLT BX»	<p>Colour: grey, white and black Grain Size: fine Mainly a faulted interval of mixed, altered mafic volcanics, grey cherts and black graphitic argillite. Approximately 25% of the interval is not brecciated with the lower 1.1 m to 209.4 m</p>		<p>Intense dolomitization of mafic sub-intervals and intense local development of yellow brown sericite. Gouge is highly graphitic</p>	<p>3-5% pyrite occurs as disseminations or blebby aggregations associated with quartz dolomite veins and fragments</p>	<p>203.3-205.4 -20% core loss</p>

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DRILL HOLE RECORD

LOGGED BY: A. G. French

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HOLE NUMBER: RG393

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
		relatively competent  Quartz dolomite veining and flooding occupy 10% of the interval either as competent blocks or broken fragments				
209.40 TO 212.70	«LITHIC WAC KE»	Colour: grey, brown, black Grain Size: fine to coarse Gradational contact with the overlying unit. Greyish, fine to coarse grained, pyritic (arenite) wacke grades into coarser granule to pebble, clast supported (conglomerate/bx) wacke. Grains and clasts tend to be flattened parallel to foliation at	80	Light coloured grains and clasts have been dolomitized	7-10% pyrite is disseminated throughout as fine grains and cubic grains with occasional coarse blebs to 3-4 mm diameter. Fine dusty pyrite in bands (3-4 mm), parallel to foliation also occurs locally	
212.70 TO 221.40	«MAF ARG CH T»	Colour: grey, greenish-brown and black Grain Size: fine to coarse Conformable contact with overlying wacke. The interval comprises deformed, folded mixed argillite, chert and dolomitized mafic. A minor sub-interval of (conglomerate/bx) wacke occurs between {218.2-218.6} «WACKE» Cherty zones display bullseye folds e.g. at 213.3 and 214.0. Foliation developed at Patchy QDV and zones of flooding occupy 10-12% of the interval	65	Intensely dolomitized and sericitized mafic sub-intervals. Green talc and fuchsite locally developed along foliation parallel to sericite	5% pyrite occurs in a variety of forms -disseminated grains and blebs assoc. with QDV and argillite interbeds -fine disseminated grains in bands or patches	
221.40 TO 231.90	«LITHIC WAC KE»	Colour: grey, brown and black Grain Size: fine to coarse Contact relationship uncertain as quartz dolomite floods the zone where the lithologies merge. The interval is dominated by a variably coloured pebble to cobble (conglomerate/breccia) wacke  Clast sizes range up to 6 cm in diameter and vary in composition from mafic to sedimentary. Zones have been flooded with quartz dolomite creating		Mafic clasts are intensely dolomitized and sericitized. Lighter coloured clasts of sedimentary origin show weak patchy to overall intense dolomitization	5-10% pyrite is distributed as fine disseminated grains and coarser blebs patches and bands. Concentrated zones of pyrite and base metals occur as follows: {227.4-227.9} «3Xcp, 3XSpGn, <0.1Xt»  Within a zone of quartz dolomite	

HOLE NUMBER: RG393

DRILL HOLE RECORD

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MINNOVA INC.  
DRILL HOLE RECORD

HOLE NUMBER: R6393

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS	
		a patchy grey white matrix to argillite, chert and mafic clasts. A 30 cm zone from 225.2-225.5 m is distinctly Het frag in nature comprising clasts supported in a black argillite matrix. The contact with the underlying mafics is marked by a minor zone of fault gouge, however the lithological change appears gradational. QDV and pyrite complicate the location of the contact point				flooding, Cp intimately associated with blebby aggregations of pyrite. Galena similarly related Sp. A single irregular blebby aggregation of tetrahedrite (3x6 mm) occurs with py and galena. From 227.9-228.4 in the zone of QDV persists but BMS diminish with <1% Sp observed. Pyrite increases overall to the contact overall to the contact with the underlying mafics, with the underlying mafics, with the minor subinterval 231.7-231.9 having 15% pyrite by volume	
231.90 TO 247.10	«DOL MAF VO LCS»	Colour: grey and brown Grain Size: fine Intensely altered interval of mafic volcanics. No relict textures are visible. Foliation well developed with sericite at:	70	Intense grey dolomitization and yellow brown sericitization. Talc and fuchsite developed in faulted zones at 246.0	Overall 2-3% pyrite occurring as fine disseminations and occasional blebs. The upper 1.0 m is more concentrated in pyrite and contains a 2cm wide zone of disseminated to blebby Sp and Gn  {231.9-232.9} «<1% Sp+Gn, 10% Py» within qtz-dol flooding		
247.10 TO 261.20	«ARG CHT WA CKE»  E.O.H.	Colour: grey, black, brown, white, green Grain Size: fine to coarse Contact with the above mafics appears gradational. the interval comprises a complex mixture of argillite, chert and well developed (conglomerate/breccia) wacke. QDV and flooding complicate the overall lithological picture, and similiary faulting and stretching distort any bedding structures. Altered mafic (dolomite+sericite), argillite, chert (and siltite), clasts, brown granule to pebble size from the wacke. Intermittent faulting occurs with a principal zone between 258.2-259.2		Dolomitization is evident throughout all light coloured clasts. Yellow brown sericite is well developed with mafic fragments/clasts. Green talc and fuchsite occur with sericite	7-10% pyrite distributed in grains, blebs, patches and bands. A concentrated zone of pyrite with BMS occurs as follows: {258.1-258.2} «20% Py, <1% SpGn»  associated with a cross-cutting vein of white quartz dolomite		

HOLE NUMBER: RG393

MINNOVA INC.  
DRILL HOLE RECORD

DATE: 29-October-1990

FROM TO	ROCK TYPE	TEXTURE AND STRUCTURE	ANGLE TO CA	ALTERATION	MINERALIZATION	REMARKS
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HOLE NUMBER: RG393

## ASSAY SHEET

DATE: 29-October-1990

Sample	From (m)	To (m)	Length (m)	CU %	ZN %	PB %	AG G/T	AU G/T	SB %	AS %	CU PPM	ZN PPM	PB PPM	S.G.	AG OZ/T	AU OZ/T	AS PPM	BA PPM	BA %	SB PPM	AG PPM	AU PPB
27206	227.90	228.40	0.50	.047	.29	.09	10.0	.31			471	2917	872				302	112		83	10.0	310
27208	231.40	231.90	0.50	.008	.03	.05	2.5	.09			79	258	462				266	119		2	2.5	90
27209	231.90	232.90	1.00	.007	.08	.06	2.3	.11			67	821	614				348	110		3	2.3	110
27210	232.90	234.40	1.50	.003	.02	.01	1.5	.03			34	191	115				243	147		1	1.5	25
27212	247.10	248.60	1.50	.002	.01	.01	1.3	.02			24	82	138				198	188		1	1.3	20
27214	252.20	253.70	1.50	.003	.02	.01	0.7	.03			32	213	103				170	260		1	0.7	29
27215	255.10	256.60	1.50	.007	.06	.04	2.4	.06			70	627	408				138	164		1	2.4	57
27216	256.60	258.20	1.60	.007	.01	.01	1.0	.25			73	102	114				263	186		1	1.0	245
27217	258.20	259.70	1.50	.010	.10	.05	1.9	.76			95	1030	453				365	23		6	1.9	761
27218	259.70	261.20	1.50	.006	.02	.01	1.3	.06			64	159	90				177	236		1	1.3	60

HOLE NUMBER: RG393

ASSAY SHEET

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HOLE NUMBER: RG393

## GEOCHEM. SHEET

DATE: 29-October-1990

Sample	From (m)	To (m)	Length (m)	SiO2 %	Al2O3 %	CaO %	MgO %	Na2O %	K2O %	Fe2O3 %	MnO2 %	TiO2 %	BA %	Zr %	Cu PPM	Zn PPM	Pb %	TOTAL %	Au PPB	BA PPH	AG PPH	PB PPH	P2O5 %	SR %	S %	TOTAL %	AS PPH	SB PPH
27180	102.70	105.70	3.00	39.56	15.10	3.81	12.68	.24	1.85	11.30	.28	.86			135	162			60	80	2.5	33	.01		2.40	86.34	84	6
27191	163.40	166.40	3.00	81.47	5.47	0.70	0.27	.03	1.45	5.38	.01	.38			123	468			200	152	3.5	275	.05		4.55	98.40	344	39
27200	209.40	212.40	3.00	54.10	9.10	2.97	5.78	.25	0.87	14.45	.25	.79			88	138			10	68	1.6	197	.09		8.78	96.60	115	1
27207	228.40	231.40	3.00	57.27	10.57	6.83	4.72	.56	1.10	8.54	.25	1.14			85	865			25	152	2.7	667	.08		4.62	94.83	157	1
27211	239.90	242.90	3.00	45.14	12.43	9.06	7.70	.56	0.84	8.45	.34	1.65			29	78			5	94	1.7	79	.01		2.21	87.70	148	1
27213	249.20	252.20	3.00	67.42	10.25	3.77	3.53	.11	1.69	5.76	.22	.59			31	99			35	261	1.0	77	.01		2.91	94.85	130	1

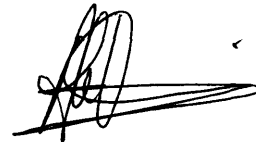
APPENDIX III  
STATEMENT OF QUALIFICATIONS



STATEMENT OF QUALIFICATIONS

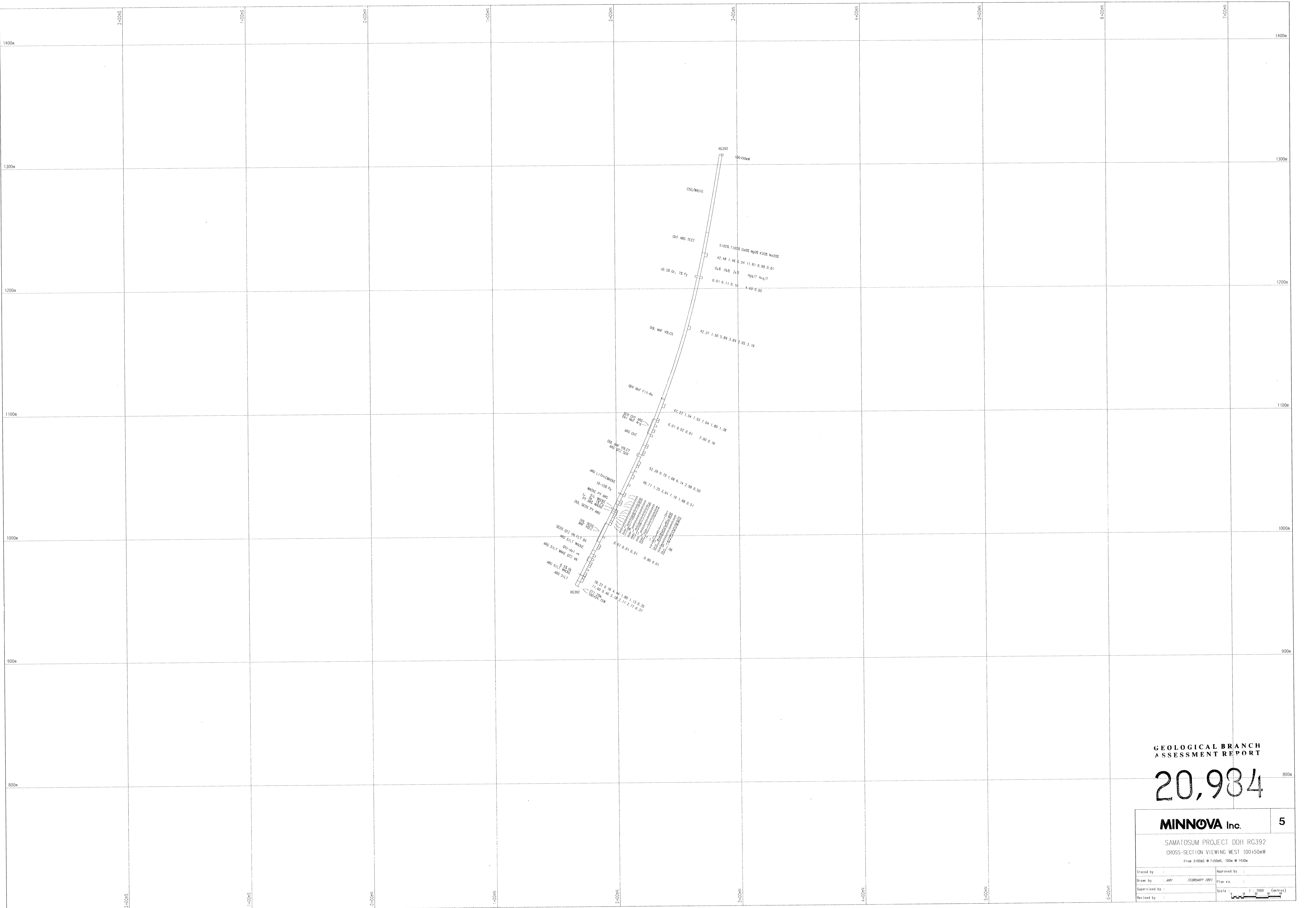
I, Alan R. Hill hereby certify that:

- 1) I hold a Bachelor of Science degree (Geology Major) obtained in 1984 from the University of Western Ontario, in London.
- 2) I have practised my profession in minerals exploration continuously since graduation.
- 3) I have personally supervised the work reported herein, in the field, and have based my recommendations on that work, my knowledge of the area, and previous experience in the area.



Alan R. Hill, B.Sc.  
Vancouver, B.C.





GEOLOGICAL BRANCH  
ASSESSMENT REPORT

20,984

MINNOVA Inc. 5

SAMATOSUM PROJECT DDH RC392  
CROSS-SECTION VIEWING WEST 100+50mW  
From 3+02m @ 7+50m, 700m @ 1430m

Traced by :	Approved by :
Drawn by : <i>ABV</i>	Drawn on : <i>FEBRUARY 1994</i>
Supervised by :	Scale : 1 : 2000 (metres)
Revised by :	

