

825635

**MINNOVA, INC.**

**DATE:** December 1, 1991  
**TO:** Dave Heberlein  
**COPIES TO:** Alex Davidson, Ian Pirie  
**FROM:** Cam Clayton  
**RE:** November Monthly Report

Rainbow-Tam O'Shanter/Wildrose Properties: Drilling was completed on the two properties on November 25, 1991. Summaries to date are attached. Drilling of the chlorite/magnetite alteration zone was completed earlier in the month. Initial interpretation of this zone indicates it is a fairly flat lying zone of approximately 25 metre thickness overlying diorite. Results from this drilling have not been outstanding although some minor encouragement is seen. Drilling in the Wildrose/Tam O'Shanter boundary area has returned somewhat encouraging Au results from beneath an area of silicification mapped at surface. The following are summaries of some of the better intersections since last month's report.

**HOLE TM 91-11 (P-10):** 12.0 metres @ 0.126% Cu  
 12.0 metres @ 0.164 g/t Au

<u>Interval</u>	<u>Length</u>	<u>Cu (ppm)</u>	<u>Au (ppb)</u>
49.3-52.3	3.0 m	2050	264
52.3-55.3	3.0 m	963	141
55.3-58.3	3.0 m	988	139
58.3-61.3	3.0 m	1042	113

**Comments:** The interval is contained within a propylitically altered diorite. Part of the interval is moderately magnetic and a small fault zone occurs within the interval.

**HOLE TM 91-11 (P-10):** 10.7 metres @ 0.208% Cu  
 10.7 metres @ 0.210 g/t Au

<u>Interval</u>	<u>Length</u>	<u>Cu (ppm)</u>	<u>Au (ppb)</u>
103.3-105.5	2.2 m	2539	210
105.5-108.5	3.0 m	2488	262
108.5-111.5	3.0 m	864	101
111.5-114.0	2.5 m	2651	278

Comments: Again, the interval is magnetic within a propylitically altered diorite. From 105.3 to 105.46 30% patchy quartz veining is observed with Py, Cp (to 1% as discontinuous stringers and clots).

HOLE TM 91-12 (P-12): 12.0 metres @ 0.171% Cu  
negligible Au

<u>Interval</u>	<u>Length</u>	<u>Cu (ppm)</u>	<u>Au (ppb)</u>
63.6-66.6	3.0 m	1085	41
66.6-69.6	3.0 m	1286	80
69.6-72.6	3.0 m	3408	154
72.6-75.6	3.0 m	1046	90

Comments: This is a zone of weak argillicly altered and chlorite/sericite altered diorite. Carbonate alteration of matrix is weak, but quartz carbonate veinlets occur through the interval. Some hematite occurs in these veinlets. Pyrite occurs to 1% and Cp is seen disseminated throughout.

HOLE TM 91-16 (P-18): 26.14 metres @ 0.315% g/t Au  
negligible Cu

<u>Interval</u>	<u>Length</u>	<u>Cu (ppm)</u>	<u>Au (ppb)</u>	<u>Assay</u>
52.0-54.78	2.78	244	1000	1.0 g/t
54.78-55.4	0.62	32	44	
55.4-58.52	3.12	196	86	
58.52-60.66	2.14	156	266	
60.66-64.11	3.45	94	130	
64.11-64.31	0.2	1317	1500	1.78 g/t
64.31-65.53	1.22	30	183	
65.53-66.13	0.6	1303	310	
66.13-69.63	3.5	69	610	
69.63-73.14	3.51	98	2600	2.85 g/t
73.14-75.15	2.0	18	1500	1.82 g/t
75.15-78.15	3.0	39	219	

Comments: The mineralized interval crosses a wide variety of alteration zones: silica, pyrite stockwork (54.78-55.4); silica, chlorite alteration (55.4-58.52); chlorite alteration (58.52-60.66); stockwork silicification (60.66-64.11); a semi-massive sulphide vein (64.11-64.31); silicified andesite (64.31-65.53); shear zone (65.53-66.13); patchy chlorite/magnetite alteration (66.13-73.14); crowded feldspar porphyry dyke (73.15-75.15); pyritic chert (75.15-80.75).

HOLE TM 91-16 (P-18): 35.99 metres @ 0.180 g/t Au  
Cu < 0.1%

<u>Interval</u>	<u>Length</u>	<u>Cu (ppm)</u>	<u>Au (ppb)</u>
108.51-110.1	1.59	839	530
110.10-113.1	3.0	210	230
113.1-116.1	3.0	122	122
116.1-119.1	3.0	83	117
119.1-122.1	3.0	143	108
122.1-125.1	3.0	199	71
125.1-128.1	3.0	284	112
128.1-131.1	3.0	198	338
131.1-134.1	3.0	165	296
134.1-137.1	3.0	223	214
137.1-140.1	3.0	158	105
140.1-143.1	3.0	161	113
143.1-144.5	1.4	125	119

Comments: The predominant rock type through this mineralized interval is a zone of pyrite and silica stockwork. Pyrite occurs to 5% throughout as disseminations and stockwork. Occasional sericite alteration is seen along fractures.

HOLE TM 91-18 (P-15): 7.55 metres @ 0.194% Cu  
negligible Au

<u>Interval</u>	<u>Length</u>	<u>Cu (ppm)</u>	<u>Au (ppb)</u>
9.05-11.28	2.23	1298	74
11.28-12.63	1.35	2563	61
12.63-14.10	1.47	3125	192
14.10-16.60	2.5	1492	32

Comments: Only partial results for this hole were available. From 3.05 to 11.28 the interval is a chert/stockwork silicification zone. From 6.0 to 11.28 is a strong tectonically brecciated zone. Trace amounts of Cp are seen. From 11.28 to 12.63 is a chloritically altered andesitic flow and from 12.63 to 14.1 is another zone of stockwork silicification with Py seen to 15% disseminated and as fracture fillings. From 14.1 to 22.82 is a sequence of chloritically and sericitically altered andesite flows and fine grained tuffs with minor pyrite.

MINNOVA, INC.

DATE: November 2, 1991

TO: I. PIRIE, D. HEBERLEIN, C. CLAYTON

FROM: C. NAGATI

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-11 (P-10) START DATE: OCT 24 END DATE: OCT 26

NORTHING: 12+00N EASTING: 8+00E ELEVATION: 1178m

AZIMUTH: 115 DIP: -45 LENGTH: 149.35m

PURPOSE: To test chlorite-magnetite alteration, andesitic volcanics, and silicification with coincident chargeability, Cu/Au soil, and rock sample anomalies.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.0	3.05	CASING
3.05	149.35	<p>PROPYLITICALLY ALTERED DIORITE: The only rock type intersected in the hole was the typical fine grained, greenish, propylitically altered dioritic intrusive. Minor narrow zones of pink Kspar alteration occur throughout the hole. The core contains variable amounts of very fine grained disseminated magnetite; the core varies from non-magnetic to moderately magnetic. Between 3.05-27.4m there is a brownish alteration halo around q/c stringers consisting of microscopic pyrite, quartz, magnetite and trace molybdenite?. Chalcopyrite occurs as disseminations and patches within the greenish prop. altered diorite and with quartz veins. Cp concentrations range from trace to 4%; the overall average is &lt;1%. There is a general decrease in Cp content with depth; at depth Cp is more frequently associated with quartz veining. The best chalcopyrite intersections are as follows:</p> <p>30.6-50.9m: 1% cp,  45.14-45.34m: 2% cp,  51.7-51.95m: 1% cp,  74.6-75m: 4% cp,  103.75-105.45m: 1% cp, and</p>

DDH TM 91-11 CONT...

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111.56-113.96m: 1% cp

\*\*\*\* END OF HOLE \*\*\*\*

DISCUSSION

The anomalous copper soil and rock samples are readily explained by the zones of relatively chalcopyrite rich diorite seen in the core. TM 91-11 has a slightly higher chalcopyrite content than hole TM 91-10 (located 350m east) and much less magnetite alteration. Both holes have chalcopyrite associated with quartz but, unlike hole TM 91-10, the current hole does not appear to have a correlation between chalcopyrite and magnetite.

MINNOVA, INC.

DATE: November 17, 1991

TO: I. PIRIE, D. HEBERLEIN

FROM: Cam Clayton

RE: DRILL HOLE SUMMARY.

DRILL HOLE: TM 91-17 (P-16) START DATE: Nov 10 END DATE: Nov 11NORTHING: 4+00N EASTING: 8+00E ELEVATION: 1370mAZIMUTH: 270 DIP: -45 LENGTH: 122.53m

PURPOSE: To test diorite, and silicification near southern contact with Permian cherts and andesites with local hydrothermal breccias. Coincident chargeability highs, resistivity lows, magnetometer highs and anomalous rock and soil geochemistry occur in area.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.00	4.27	CASING.
4.27	5.62	ANDESITE. This unit is a medium grained silicified andesite which has undergone local argillic alteration. Pyrite averages 1-2% disseminated.
6.62	7.62	ARGILLIC ALTERATION. The original rock was feldspar porphyritic and has undergone strong clay alteration of feldspars.
7.62	10.23	DIORITE. This is a medium grained feldspar porphyritic diorite that has been chloritically altered. Leucoxene and/or sericite may be present as an alteration mineral. Pyrite occurs disseminated.
10.23	11.53	ANDESITE TUFF. This is a bedded tuffaceous unit containing 2% Py occurring as disseminations and veinlets.
11.53	13.46	BRECCIATED FELSIC INTRUSIVE. This is a grey white brecciated unit that is moderately silicified. The felsic intrusion is white, crystalline with little to no mafic minerals

DDH TM91-17 CONT...

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(possibly alaskite). Mineralization consists of 10-15% Py, trace Cp, and possibly trace arsenopyrite.

- 13.48 15.85 ALTERED ANDESITE. The unit is chloritically altered andesite occasionally cut by feldspar porphyritic dykes. Pyrite occurs to 15% and arsenopyrite may be present in trace amounts.
- 15.85 20.23 FELSIC INTRUSIVE. This a grey white granular unit with little to no mafic minerals. Pyrite occurs to 5%. From 20.5 to 21.80 a semi-massive sulphide vein (30-40% Py, trace As) occurs. Quartz-carbonate veins are vuggy.
- 23.23 25.07 ANDESITE TUFF. This fine grained tuffaceous unit is hydrothermally brecciated in areas and contains several small Py veins associated with quartz carbonate veins.
- 25.07 50.94 DIORITE PORPHYRY. This diorite ranges from leuco-diorite to melano-diorite. Both argillic and propylitic alteration is seen. Magnetite occurs to 40%, pyrite occurs to 15% locally, and Cp is seen in trace amounts locally.
- 50.94 73.65 INTERLAYERED ANDESITE TUFF AND FLOWS. Chloritic alteration is the predominant alteration type with local silicification. Pyrite is disseminated to 15% from 51.21 to 54.25. Chalcopyrite occurs in trace amounts locally. Occasional talc veins cross cut the interval.
- 73.65 74.80 FELSIC DYKE. This is a fine grained felsic intrusive that has been argillicly altered and contains 1% pyrite disseminated throughout.
- 74.80 113.08 ANDESITIC TUFFS CUT BY DIORITE. This interval consists of chloritically altered tuffaceous units intruded by argillicly to propyliticly altered diorite. Occasional small semi-massive pyrite veins cross cut the andesitic units. The diorite generally contains 5 to 10% Py with trace amounts of Cp. The Cp usually occurs with epidote and quartz-carbonate veinlets. The diorite contains up to 40% magnetite locally.

~~TM91-17 CONT.~~

113.08 116.5 SILICIFIED ANDESITE. The interval is chloritic and overprinted by moderate silica alteration. Occasionally quartz carbonate veinlets are seen. Pyrite occurs to 10% disseminated throughout.

118.3 122.53 LEUCODIORITE. This is a chloritically altered leucodiorite with small zones of stockwork silicification. Pyrite occurs to 20% finely disseminated throughout.

\*\*\*\*END OF HOLE\*\*\*\*

DISCUSSION

Geology and mineralization seen in this hole explain geophysical and geochemical anomalies at surface. The magnetite content associated with dioritic rocks is responsible for the magnetic anomaly over this area. This alteration may be a northern, weaker, extension of the chlorite/magnetite alteration seen in hole TM91-16. Disseminated pyrite content of the hole explains the good chargeability and resistivity responses of the geophysical survey.



MINNOVA, INC.

DATE: November 17, 1991

TO: I. PIRIE, D. HEBERLEIN, C. CLAYTON

FROM: Cam Clayton

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-16 (P-18) START DATE: Nov 8 END DATE: Nov 10

NORTHING: 2+00N EASTING: 7+75E ELEVATION: 1360m

AZIMUTH: 270 DIP: -45 LENGTH: 166.12m

PURPOSE: To test strong magnetic anomaly beneath siliceous topographic high with associated anomalous soil and rock geochemistry and chargeability anomaly.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.0	3.05	CASING
3.05	7.00	BROKEN CORE. Oxidized bedrock up to 10% Py.
7.00	15.22	SILICIFIED ANDESITE. This is a fine to medium grained silicified andesitic unit containing small sections of hydrothermal breccias cemented by quartz carbonate. The interval contains 10% Py on average with up to 30% locally. The dominant sulphide appears to be marcasite. From 13.53 to 13.92 is an interval of 70% pyrite. Some trace amounts of arsenopyrite are observed. Alteration through the interval is chloritic with one zone from 11.47 to 11.7 of 20% sericite.
15.22	19.13	CROWDED FELDSPAR DYKE. This a fine to medium grained dyke with 70%-80% euhedral feldspars. The feldspars are altered to clay, chlorite and epidote. Pyrite occurs in trace amounts finely disseminated throughout. A fault zone occurs from 16.6 to 17.86.
19.13	25.15	HYDROTHERMAL BRECCIA. This is a grey green crowded feldspar porphyry dyke that has been hydro-brecciated. Trace to 1% pyrite occurs throughout. It is weakly magnetic in areas.

## DDH TM 91-16 CONT... -2-

- 25.15 39.00 SILICEOUS ANDESITE/CROWDED FELDSPAR DYKE. This is an interval of alternating siliceous andesite and crowded feldspar porphyry dykes. Pyrite averages 5-10% throughout the interval with local highs of 20%. Trace amounts of Cp are seen locally. Chloritic alteration and quartz-carbonate veinlets are common throughout. Some talc veining is also observed.
- 39.00 42.40 MAGNETITE/SULPHIDE VEIN. This vein is strongly oxidized and contains 20 to 30% Mt as patchy blotches throughout. The remainder is pyrite. Some local stockwork silicification is observed.
- 42.40 54.78 SILICEOUS ANDESITE/CROWDED FELDSPAR DYKE. This is similar to the interval from 24.15 to 39.00. Alteration appears to be increasing down hole with greater presence of chlorite, epidote, sericite, and albite. Again Py averages about 10% through this interval with local highs of 25%.
- 34.78 55.4 SILICA/PYRITE STOCKWORK. This is a fine grained zone of silica and pyrite stockworking. The density of stockworking is 70 to 80%. Stockwork pyrite occurs up to 30% locally with trace amounts of Cp.
- 55.40 60.66 SILICA/CHLORITE ALTERATION. The protolith is most likely andesite but generally this unit is indistinguishable. Talc veinlets occur locally. Pyrite averages 10 to 20% through the interval occurring as disseminations and fracture filling veinlets.
- 60.66 64.31 STOCKWORK SILICIFICATION. The interval consists of 70 to 90% stockwork fracturing with subsequent introduction of silica. Trace amounts of Cp are seen and Py is present averaging 10%. From 64.11 to 64.31 is a semi-massive pyrite vein.
- 64.31 66.13 SILICIFIED ANDESITE. This interval is moderately silicified with Py averaging 10%. From 65.53 to 66.13 is a shear zone containing 20 to 30% disseminated Py and trace Cp.

## DDH TM 91-16 CONT... -3-

66.13	73.14	CHLORITE/MAGNETITE ALTERATION. Magnetite throughout this interval averages 20% with local highs of 30 to 40% occurring as patchy blotches. Py averages 5 to 10% through the interval with local highs of 20 to 30%. Occasional quartz carbonate veins are seen and have a vuggy appearance with bladed calcite replaced by silica.
73.14	75.15	CROWDED FELDSPAR DYKE.
75.15	80.75	PYRITIC CHERT. This unit shows a weak stockwork silicification and 5% pyrite.
80.75	96.36	STOCKWORK SILICIFICATION. As described previously, a unit of high fracture density (to 90%) that has seen subsequent introduction or remobilization of silica. Pyrite averages 5% occurring as disseminations and stockwork mineralization. Trace Cp is seen.
96.36	99.07	BRECCIA ZONE. This is a brecciated zone containing fragments of the overlying stockwork silicification. Pyrite averages 15 to 20% with trace amounts of Cp, and occurs as stockwork and disseminated mineralization.
99.07	104.23	PYRITIC CHERTY TUFF. Minor chlorite and sericite alteration occur through this siliceous unit which averages 2 to 5% pyrite.
104.23	108.51	STOCKWORK SILICIFICATION. As described previously, this interval also contains local sericitization along fractures. Pyrite averages 2 to 5% as disseminations and veinlets.
108.51	110.10	ALTERED ANDESITE. Alteration of this unit varies from strong silicification to sericitization to chloritization of foliation. Pyrite averages 30%.
110.1	144.5	STOCKWORK SILICIFICATION. As described previously, up to 90% stockwork fracturing with subsequent introduction of silica. Pyrite occurs as disseminations and as fracture filling veinlets averaging 5 to 10%. Local highs of 20% are seen, as are trace amounts of Cp. Sericite occurs up to 20% locally.

## DDH TM 91-16 CONT... -4-

144.5	151.90	ANDESITE TUFF/FLOW. This interval consists of interlayered sericitically altered tuff and silicified andesite. Pyrite averages 2-5%.
151.90	153.5	FAULT.
153.50	155.71	STOCKWORK SILICIFICATION. As previously described. This interval contains Py averaging 15% occurring as fine grained disseminations and veinlets.
155.71	156.82	SILICIFIED ANDESITE. The interval contains 2 to 5% disseminated pyrite.
156.82	164.5	CHERTY SILICIFICATION. This interval is clearly a chert in areas while elsewhere it resembles the stockwork silicification previously described. Pyrite occurs up to 10% as veinlets and disseminations.
164.50	166.12	TUFF. This medium grained tuffaceous unit has undergone strong sericite alteration (20 to 30% sericite) and contains only trace amounts of Py.

\*\*\*\* END OF HOLE \*\*\*\*

### DISCUSSION

The magnetic anomaly is easily explained by the presence of both the magnetite/pyrite vein, and the zone of chloritic/magnetitic alteration. The disseminated pyrite content through the hole undoubtedly resulted in the broad zone of chargeability shown by the I.P. anomaly. The zone of stockwork silification and minor stockwork mineralization is the most interesting aspect of this hole. If this zone carries gold values it may be a very attractive future exploration target.

MINNOVA, INC.

DATE: November 4, 1991

TO: I. PIRIE, D. HEBERLEIN, C. CLAYTON

FROM: M. MCDOWELL

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-12 (F-12) START DATE: OCT 26 END DATE: OCT 29

NORTHING: 10+00N EASTING: 8+00E ELEVATION: 1226m

AZIMUTH: 090 DIP: -70 LENGTH: 97.23m

PURPOSE: To test chlorite-magnetite alteration, andesitic volcanics, and silicification with coincident chargeability, Cu/Au soil, magnetic, and rock sample anomalies.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.0	0.6	CASING
0.6	66.8	DIORITE: Typical fine grained propylitically altered diorite. The interval is generally non magnetic; localized magnetism is due to occasional Mt stringers. Between 4.17-12.5m the core is intensely fractured, rubble, and clay altered, indicative of one or more fault zones. Quartz veining is fairly intense in the interval 0.61-9.3m, although mineralization is minor. In general pyrite <= 1%, chalcopyrite <.5%, and molybdenite <.5%. The sulphides occur as very fine grained disseminations in the matrix or in fine quartz-carb veinlets. There is a gradational change from this unit to the underlying argillically altered diorite.
66.8	73.48	WEAK ARGILLIC ALTERED DIORITE: Pale greenish, leucocratic diorite. Mafics are altered to chlorite; feldspars are altered to a mixture of clays+calcite. Talc occurs as blebs and in veinlets. Banded quartz-carb veinlets with drusy crystals occur throughout. Py 1%; Cp, Mo <1% as disseminations and in quartz-carb veinlets. A similar unit is seen in TM 91-13.
73.48	76.2	CHLORITE-SERICITE ALTERED DIORITE: Strongly

DDH TM 91-12 CONT...

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altered, greenish-gray diorite. Non-magnetic. The main alteration assemblage is chlorite-sericite-carbonate. Mineralization is minor in this interval- Py <1%; Cp occurs as rare disseminations in quartz veinlets.

- 76.2      87.1      INTENSE CARB-SERICITE ALTERED DIORITE: This appears to be a more intensely altered version of the diorite seen above, the main difference being an abundance of carbonate in patchy zones that are beige in colour, with up to 3% very finely disseminated pyrite. Drusy quartz-carb veinlets are common in this interval and the core has been microfractured and silica-healed.
- 87.1      88.6      CHLORITE-SERICITE ALTERED DIORITE: As interval from 78.48-76.2m. Pyrite is very finely disseminated throughout, approximately 2%. Cp occurs as rare disseminations, and Mo occurs in trace amounts in quartz-carb veinlets.
- 88.6      96.93      CHERT/QUARTZ VEIN?: This unit consists of approximately 80% fine grained, white to grey recrystallized chert, with 20% greenish-grey, chlorite-sericite altered diorite (as in the overlying unit). It is possible that the chert could in fact be a quartz vein; in either case later hydrothermal activity has occurred, as indicated by brecciation, silica-healed microfractures, and open-space filling by quartz, calcite, and fluorite crystals. Very fine grained disseminated pyrite occurs in the dioritic patches to approx. 5%, but is much less abundant in the chert. Trace molybdenite occurs in the chert; Cp is negligible.
- 96.93      97.23      ALTERED VOLCANIC(?): Green, aphanitic, clay-altered volcanic. The core is non-magnetic. There is 1% pyrite which occurs as disseminations and fine stringers.

\*\*\*\* END OF HOLE \*\*\*\*

#### DISCUSSION

The chalcopyrite intersected in the diorite at the top of this hole is probably the source of the Cu anomalies seen in soils at surface. It is expected that Au values in core will DDH

TM 91-12 CONT...

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correspond to the occurrence of chalcopyrite. According to GOM Stewart, this hole is located in an area that has been explored for Cu-Mo mineralization in the past; the presence of small amounts of molybdenite in the core is therefore not surprising. The geology map indicates that this hole should have collared in a zone of silicification, when in fact it was a zone of quartz-veined diorite. It is not readily apparent why the chargeability (as seen in section) should increase downhole, although there are localized increases in the concentration of pyrite with depth.

MINNOVA, INC.

DATE: November 5, 1991

TO: I. PIRIE, D. HEBERLEIN, C. CLAYTON

FROM: C. NASATI

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-13 (F-13) START DATE: OCT 29 END DATE: OCT 30

NORTHING: 10+10N EASTING: 11+22E ELEVATION: 1169m

AZIMUTH: 270 DIP: -45 LENGTH: 102.4m

PURPOSE: To test chlorite-magnetite alteration, andesitic volcanics, and silicification with coincident chargeability, Cu/Au soil, and rock sample anomalies.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.0	3.05	CASING
3.05	53.64	ARGILLIC TO PROPYLITIC ALTERED DIORITE: The protolith consists of a fine to medium grained dioritic intrusive which has been variably altered. Between 3.05- 28.76m the core is initially weakly to moderately argillically altered; the intensity of alteration is very weak below 24.55m. The fact that the alteration is near surface in an area affected by a number of brittle fault structures and an abundance of groundwater may indicate that the alteration is surficial rather than hydrothermal; alternately, the presence of vuggy epithermal veins containing fluorite and the presence of a similar, though smaller, argillic zone at depth in hole TM 91-12, where the above ground conditions are not present, may indicate a hydrothermal origin. Fluorite bearing veins occur between 24.45-24.55m, 29.1-29.7m, and 30.7-30.8m. Below 29.76m the diorite is propylitically altered. There is 1% pyrite disseminations and stringers present in the interval. Only trace to minor chalcopyrite is present.
53.64	92.5	ALTERED ANDESITE?: The core varies between a



DDH TM 91-13 CONT...

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massive dark green texture caused by propylitic alteration (chlorite, calcite, minor hematite) and mottled shades of green through grey caused by local bleaching, silicification and/or sericitic alteration. 59.4-62.18m: 30% of this interval is comprised of qtz-fluor veining. Up to 3% pyrite is disseminated throughout the core.

82.3	91.35	PROPYLITICALLY ALTERED DIORITE: Typical fine grained weakly altered dioritic intrusive.
91.35	97.85	ALTERED VOLCANICS: The primary rock in this interval consists of a massive, propylitically altered andesitic? volcanic which is locally silicified. Minor diorite present. Up to 4% pyrite is disseminated within the unit; trace chalcopyrite present.
97.85	101.5	ALTERED DIORITE: The diorite has been intensely affected by propylitic alteration, bleaching and localized silicification and sericite alteration. The diorite is non-magnetic.
101.5	102.4	PROPYLITICALLY ALTERED ANDESITE?: The volcanics are typical of the andesite in the area.

\*\*\*\* END OF HOLE \*\*\*\*

### DISCUSSION

The difference in the amount of sulphide mineralization present in diamond drill holes TM 91-12 and TM 91-13 is striking. The rocks intersected in the holes are similar and yet TM 91-12 intersected a larger amount of chalcopyrite and molybdenite than did TM 91-13 which was nearly barren of these sulphides. One explanation for the difference may be related to the zones of argillic(?) alteration. In TM 91-12 much of the mineralization lies uphole of the argillic zone. In TM 91-13 the first intersected core consists of the argillically altered diorite. In both holes epithermal veins containing fluorite were intersected downhole of the argillic zones which may indicate that the core of a weakly mineralized system lies to the west of, and at a higher elevation than, TM 91-13. The copper mineralization intersected in TM 91-11 and the known surface mineral occurrences in the vicinity of TM 91-12 together with the mineralization in TM 91-12 form a weakly mineralized south-south-westerly trending band which is coincident with Cu-Au soil geochemical anomalies. If the core assays are encouraging consideration should be given to drilling an easterly dipping hole at 8+00N, 8+00E.

MINNOVA, INC.

DATE: November 17, 1991

TO: I. PIRIE, D. HEBERLEIN

FROM: Cam Clayton

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-18 (P-15) START DATE: Nov 12 END DATE: Nov 14

NORTHING: 6+00N EASTING: 8+75E ELEVATION: 1292m

AZIMUTH: 270 DIP: -45 LENGTH: 199.34m

PURPOSE: To test diorite, and silicification near southern contact with Permian cherts and andesites. The hole is to be cored in cherty stockwork silicified Permian sediments and is designed to drill through an inferred east-west trending fault zone into diorite. Local hydrothermal breccias are seen in the area, and coincident chargeability, resistivity, magnetometer, and soil and rock geochemical anomalies are present.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.00	3.05	CASING.
3.05	14.1	CHERT/STOCKWORK SILICIFICATION. This is a strongly oxidized interval that has been brecciated. The extent of oxidation suggests pyrite may be present in high concentrations and up to 15% disseminated and stockwork pyrite is seen with trace amounts of chalcopyrite.
14.1	28.90	INTERBEDDED ANDESITIC FLOWS AND TUFFS. The interval shows evidence of flow banding and bedding. Alteration is primarily chloritic and sericitic. Only trace to 5% pyrite is seen through the interval.
28.90	30.45	BANDED FELSIC ASH AND FELSIC INTRUSIVE. The ash unit is very fine grained consisting of alternating bands of grey, white, red and green. The felsic intrusive is fine grained primarily feldspars with no mafics. Trace pyrite throughout.

DDH TM 91-18 CONT...

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- 30.45 33.14 ANDESITIC TUFF. The unit is chloritically altered with only trace pyrite.
- 33.14 34.78 PYRITIC INTRUSIVE. This may be the same as felsic intrusive described previously but contains up to 30% pyrite and is extremely oxidized.
- 34.78 38.48 ANDESITE TUFF. This is a chloritically altered and silicified unit with occasional pyrite, quartz, and talc veinlets. A small hydrothermal breccia cross cuts at 37.9m.
- 38.48 40.3 BRECCIA/INTRUSIVE. This interval contains brecciated fragments of intrusive and andesite with 10% Py occurring as small lenses along a shear fabric.
- 40.3 44.0 ANDESITE TUFF. This is a chloritically altered unit with 10% talc occurring as veinlets. Small hydrothermal breccias cross cut the core in a number of areas.
- 44.0 44.84 HEMATITE BRECCIA ZONE. This may have been an intrusive originally but is now 40% hematized with approximately 20% talc. Pyrite occurs to 15% throughout with trace amounts of Cp.
- 44.84 56.4 ALTERED ANDESITE FLOW OR TUFF. This is an extremely chloritically and sericitically altered andesite flow or tuff. Several zones of hydrothermal and tectonic brecciation cross cut the interval. From 46.9 to 47.54 up to 40% pyrite occurs. A zone of hematite alteration similar to the previous interval is seen from 48.13 to 48.7.
- 56.4 57.37 CHERTY SILICIFICATION. This is a highly fractured unit with subsequent introduction of silica, and pyrite along fractures. Pyrite only reaches concentrations of 2% as stockwork.
- 57.37 63.70 COARSE FELDSPAR HORNBLende DIORITE PORPHYRY. This is a coarse grained porphyritic unit that is generally silicified. From 57.37 to 63.7 pyrite occurs disseminated to 2% with trace amounts of Cp. From 58.5 to 63.7 magnetite occurs to 40% as patchy blebs throughout. From 65.0 to 65.4 pyrite occurs to 50% in a quartz vein.

DRAFT 91-18 CONT.

-3-

- 69.70 85.84 PYRITIC CHERT/SILICEOUS TUFF. This fine grained interval consists of alternating pyritic chert and siliceous tuff. Pyrite occurs to 5% as disseminations and as fracture filling veinlets.
- 85.84 91.90 DIORITE. This interval varies compositionally from a felsic looking diorite to more mafic looking phases. The unit contains up to 30% Mt in areas, and is sericitically altered locally. From 85.84 to 97.6 pyrite occurs to 5% with trace Cp. Generally Py and Cp occur in association with quartz carbonate veinlets.
- 91.90 104.6 LAFILLI TUFF. The unit consists of andesitic fragments up to 10 cm in dimension in a finer matrix. Numerous faults cross cut the unit from 92.8 to 99.36. Sulphides are absent until 101.19 to 101.34 where Py occurs to 10% with trace Cp.
- 104.6 151.00 ANDESITE. This unit is generally chloritically and sericitically altered with some silicification and talc veining. Good amygdaloidal textures are observed locally. The interval is cut by numerous faults and hydrothermal breccias. Some localised areas of up to 20% Mt are noted. Pyrite generally occurs in concentrations of up to 10% with localised areas of up to 30% (106.3 to 108.2).
- 151.00 153.66 DIORITE. This is a weakly propylitized unit that has been carbonatized (20%) and sericitized (10%). It is weakly magnetic. Pyrite occurs to 2% disseminated throughout and a small Cp veinlet occurs at 153.00.
- 153.66 186.66 SILICIFIED PORPHYRY ANDESITE. This is a propylitized, silicified porphyritic andesite showing local amygdaloidal textures. Zones of sericitization and chloritization occur locally. Minor zones of K<sup>+</sup>sp. flooding are seen. It is weakly to moderately magnetic in areas. Pyrite content averages 5% for the interval with up to 20 % locally as disseminations and veinlets.

DDH TM 91-18 CONT...

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186.86 189.70 DIORITE DYKE. This is a fine grained chloritically and sericitically altered unit cross cut by a series of faults. Pyrite occurs locally up to 20%.

189.70 191.34 ANDESITE. This a chloritized and silicified andesite flow with chloritically altered amygdules. The bottom 34 cm of the unit is strongly fractured (70%) and silicified. Pyrite occurs in trace amounts.

191.34 199.34 CHERTY ANDESITE TUFF. This is a fine grained tuffaceous unit that has been silicified. Minor talc veins occur within it. Pyrite occurs in trace concentrations.

\*\*\*\*END OF HOLE\*\*\*\*

DISCUSSION

As stated in the purpose this hole was designed to test magnetic, chargeability, resistivity and structural targets. A number of fault zones were intersected within the zone but the main inferred fault zone was not. This may suggest that the well defined lineament seen at surface and inferred to be a fault is in actuality an intrusive contact or weakly resistant alteration zone. The chargeability, resistivity and magnetometer anomalies were explained by the mineralization and alteration seen in the hole. Unfortunately visible economic mineralization for the most part was absent.

MINNOVA, INC.

DATE: November 14, 1991

TO: I. PIRIE, D. HEBERLEIN, C. CLAYTON

FROM: Cam Clayton

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-15 (P-23) START DATE: Nov 6 END DATE: Nov 7

NORTHING: 4+00S EASTING: 12+55E ELEVATION: 1202m

AZIMUTH: 090 DIP: -50 LENGTH: 152.70m

PURPOSE: To test diorite intruding Permian sediments with chargeability and mag highs, and weak to strong Au soil geochemistry for stockwork and/or sediment hosted disseminated mineralization.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.0	9.14	CASING
9.14	11.6	BROKEN CORE.
11.6	36.82	CROWDED FELDSPAR PORPHYRY. The core consists of a crowded feldspar porphyry intrusive, grey to green in colour with equant 2mm size feldspar crystals, randomly oriented. Small quartz carbonate veins occur through the interval at random orientations. From 11.6 to 17.3 the feldspars have undergone strong argillic alteration to clays. From 34.48 to 34.53 angular clasts of the porphyry are seen in a quartz carbonate hydrothermal breccia. From 21.0 to 36.82 leucoxene to 10% may be present. Trace amounts of disseminated pyrite are present for the interval, and from 24.13 to 24.24 a sequence of thin sheeted pyrite veins is present.
36.82	48.36	TRACHYTE DYKE/CROWDED FELDSPAR PORPHYRY. This interval consists of alternating units of trachyte dykes and crowded feldspar porphyry. The trachytic dykes are probably feeders to Tertiary Marron Formation and consist of 10% - 15% pyroxenes on a mm scale set in fine grained ground mass of feldspars.

## DDH TM 91-15 CONT... -2-

The crowded feldspar porphyry is light grey/green in colour with roughly equant grains. No sulphides appear through this interval.

- 48.36 49.68 FAULT ZONE. This is a clay rich fault zone ranging from fault gouge to fault breccia with quartz carbonate healing.
- 49.68 54.00 LITHIC WACKE?. This is a moderately sorted wacke with grain sizes of approximately 1 mm but containing fragments up to 1 cm in dimension. Occasional quartz carbonate stringers occur through the interval.
- 54.00 56.90 FAULT ZONE. This interval consists of several faults cutting the core at high angles.
- 56.90 58.1 TRACHYTIC DYKE. Tertiary feeder to Marron Fm.
- 58.1 66.52 CHERTY ARGILLITE. The core consists of dark grey to black fine grained cherty argillite containing stockwork fracturing throughout up to 50%. Stockwork carbonate veinlets up to 20 % occur through the zone. Trace to 1% pyrite is associated with this unit occurring as disseminations and as stockwork stringers. This unit is very graphitic.
- 66.52 68.88 CONGLOMERATE. This is a coarse grained unit containing subrounded to rounded elongated pebbles of cherty composition.
- 68.88 71.32 FAULT GOUGE. Clay rich.
- 71.32 152.70 INTERBEDDED GRAPHITIC ARGILLITE, SANDSTONE, AND CONGLOMERATE. Occasional trace amounts of disseminated pyrite are associated with these sediments. From 84.79 to 88.7 a trachytic dyke cross cuts these units.

\*\*\*\* END OF HOLE \*\*\*\*

#### DISCUSSION

The lack of sulphides encountered throughout the hole suggests that the induced polarization anomaly is caused by the graphitic sediments intersected. The weak mag anomaly is not explained by the geology found in the hole.

MINNOVA, INC.

DATE: November 17, 1991

TO: I. PIRIE, D. HESERLEIN

FROM: Cam Clayton

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-19 (P-17) START DATE: Nov 14 END DATE: Nov 15

NORTHING: 1+50N EASTING: 6+00E ELEVATION: 1370 m

AZIMUTH: 090 DIP: -70 LENGTH: 108.8m

PURPOSE: To test magnetic anomaly, chargeability high, resistivity low, and anomalous soil geochemistry on flanks of topographically high siliceous cap.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.00	7.32	CASING
7.32	16.6	INTERBEDDED ANDESITIC TUFFS AND CHERT. This is an aphanitic ash tuff interbedded with grey chert. Dissolution along fractures gives vuggy appearance in areas. Pyrite occurs to 15% as fine disseminations.
16.6	46.9	CHERT/STOCKWORK SILICIFICATION. This is similar to the stockwork silicification described in hole TM91-16 and is highly microfractured with silica healing. Occasional zones of brecciation occur throughout. Pyrite generally occurs as disseminations and coarser blebs with some localised areas of pyrite stockwork and averages 3%. Minor Cp has been observed.
46.9	55.2	INTERBEDDED TUFF AND CHERT. This is similar to that described in the interval from 7.32 to 16.6. Chlorite and sericite alteration is commonly observed in the tuffaceous segments. Again visible mineralization consists primarily of pyrite as disseminations and occasional stockworks averaging 3 to 3% for the interval. Chalcopyrite is seen only in trace amounts.



DDH TM 91-19 CONT...

- 55.2      63.4      ANDESITE. This is a fine grained to aphanitic flow with a mottled appearance in areas. Minor carbonate alteration is seen, as is chlorite and sericite. The occasional small scale fault cuts the core. Pyrite averages 8%. At 59.74 m a small feldspar porphyritic dyke cuts the core.
- 63.4      65.0      INTERBEDDED TUFF AND CHERT. Again this is similar to that described from 7.32 to 16.6. Pyrite occurs disseminated to 8% throughout.
- 65.0      65.93      ARGILLICLY ALTERED FELDSPAR PORPHYRY. The core has been strongly altered to sericite and chlorite and contains approximately 5% disseminated pyrite.
- 65.93      67.35      FELDSPAR PORPHYRY. This is a relatively unaltered feldspar porphyritic intrusive. Alteration that is present consists of very weak chlorite/sericite/k'spar. No visible mineralization.
- 67.35      108.8      DIORITE/QUARTZ DIORITE. This interval consists of intrusive rock showing gradational compositional variations from dioritic to quartz dioritic phases. Generally the quartz rich phases are coarser grained than the dioritic phases. Occasional hydrothermal breccias are seen in the interval. Alteration varies from a weak propylitic (with epidotic veins) to argillic (alteration of feldspars to clays). Pyrite averages roughly 2% through the interval with local highs of 5%.

\*\*\*\* END OF HOLE \*\*\*\*

DISCUSSION

Weather conditions and access difficulty necessitated moving of the originally planned location for hole TM91-19 from 200N, 575E to 150N, 600E. This may have had some effect on the adequacy of testing of the targets. The chargeability and resistivity anomalies are explained by the pyrite content of both the cherts and andesitic volcanics, and of the intrusives intersected in the drilling. However, the magnetic anomaly located on line 200N was not explained.

MINNOVA, INC.

DATE: October 29, 1991

TO: I. PIRIE, D. HEBERLEIN, C. CLAYTON

FROM: C. NAGATI

RE: DRILL HOLE SUMMARY

DRILL HOLE: TM 91-10 (P-11) START DATE: OCT 23 END DATE: OCT 24

NORTHING: 12+00N EASTING: 11+50E ELEVATION: 1146m

AZIMUTH: 090 DIP: -50 LENGTH: 132.28m

PURPOSE: To test chlorite-magnetite alteration, andesitic volcanics, and silicification with coincident chargeability, Cu/Au soil, magnetic, and rock sample anomalies.

<u>INTERVAL</u>		<u>DESCRIPTION OF INTERVAL</u>
<u>FROM</u>	<u>TO</u>	
0.0	3.3	CASING
3.3	74.5	DIORITE: Typical fine grained propylitically altered diorite. Magnetism throughout the interval varies between very weak to intense (very localized occurrences). Sulphide content consists of <= 2% pyrite and <1% very fine grained disseminated chalcopyrite. Between 16.3-70.05m there are small intervals of generally weak K-spar alteration. The K-spar alteration, while locally occurring throughout the dioritic groundmass, is frequently associated with stringers of quartz and/or magnetite. A quartz-magnetite-chlorite-tremolite? vein was intersected between 41.85-42.21m. This vein contains up to 4% chalcopyrite. 4% chalcopyrite also occurs in a quartz vein zone between 58.4-59.6m.
74.5	86.35	TRACHYTE: Aphanitic, K-spar rich matrix supports up to 15% plagioclase phenocrysts and 5% quartz eyes. The unit is weakly magnetic.
86.35	94.7	PROPYLITICALLY ALTERED DIORITE: The unit is non-magnetic.

~~crosscutting chlorite/magnetite stringers~~  
comprise 15% of the unit.

109.1      117.8      TRACHYTE:      The typical trachyte unit consisting of an aphanitic K-spar rich matrix and plagioclase phenocrysts. Between 116.6-117.5m a calcareous andesitic? unit was intersected.

117.8      132.28      PROPYLITICALLY ALTERED DIORITE: Fine grained diorite contains patchy weak to moderate hematite, chlorite, epidote alteration.

\*\*\*\* END OF HOLE \*\*\*\*

#### DISCUSSION

The current hole again intersected enough disseminated chalcopyrite within the dioritic intrusive to account for the copper soil anomalies in the area. In the hole chalcopyrite tends to have its highest concentrations where it is associated with quartz and/or magnetite. The K-spar alteration is also commonly concentrated as envelopes around magnetite stringers, which leads me to believe that the K-spar is attributable to alteration rather than protolith mineralogy.

# MINNOVA

MEMORANDUM

DATE: December 2, 1991  
A TO: I. D. Pirie  
COPIES A COPIES TO: A. J. Davidson  
DE FROM: J. D. Kapusta  
SUJET SUBJECT: Progress Report - November

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SEDEX properties within the Gataga Camp have been reviewed and a "wish list" of potential holdings put together. It's recommended that, before any acquisition is considered, a tour of the Cirque deposit be arranged followed by the on-site evaluations of properties on the list. This would require approximately two weeks of work during July of 1992.

The Miller Lite property of Letitia Resources (Ivan Holmes and Joe Lassiter), shear hosted gold located just north of Hope, B.C., has been reviewed and turned down. Letitia has rediscovered the old Murphy showing.

The Le Mare property of Stow Resources is being reviewed. This is a porphyry copper-gold-molybdenum target similar to Island Copper, and is a recent discovery that to date has received limited work; no diamond drilling. The alteration cap to the system is exposed in cross section along a hill side and displays classic zonation. The alteration cap is developed in Lower Jurassic, mafic volcanics of the Bonanza Group, with the alteration being well developed and pervasive ranging from propylitic through argillic to advanced argillic.