

Phelps Dodge Corporation of Canada

DIAMOND DRILL LOG

PROPERTY: Mary March (294)
HOLE No.: MM294-7
Collar Eastings: -11000.00
Collar Northings: 144.00
Collar Elevation: 0.00
Grid: Mary March -PDC

Collar Inclination: -45.00
Grid Bearing: 180.00
Final Depth: 482.00 metres

Logged by: J.G. Thurlow
Date: July 4, 1999
Down-hole Survey: Tropari

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS					
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
0	6.1	Overburden									
6.1	45.5	Intermediate to felsic flows									
6.1	38.0	Massive medium to dark green, intermediate flow or intrusive. Generally aphyric but with common leucoxene specks. Rare plagioclase phenocrysts. Nil to incipient sericite Alteration. Minor disseminate pyrite. Local weak flow banding. Medium hardness. Moderately broken core to 15m, weakly broken beyond 15m. Locally grades from green to hard, orange alteration which is associated with epidote veining (e.g., 24.5-27). Some elongate silica-filled voids. Local dark purplish colour (weak hematite?). Local bright red (war paint) hematite in late fractures (potential I.P. anomalies!).									
38.0	45.5	Felsic flow characterized by poorly developed pseudofragmental texture with mottling of greenish and brownish colours. Some delicate banding associated with elongate fine vesicles. Some perlitic cracks. Minor broken core. Rare speck disseminated pyrite. Essentially unaltered apart from colour variations. Shearing and minor gouge at 40 degrees to core at lower contact.									

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS					
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
45.5	76.1	Zone of brittle shearing, broken core and intrusives within intermediate-felsic volcanics.									
45.5	49.0	Medium green diabase characterized by fine leucoxene dust. Small chlorite and calcite amygdules. Moderately broken core at both contacts and throughout.									
49.0	64.5	Relatively unaltered intermediate-felsic flows, as above 45.5m. Moderately broken core, weak shearing and fault gouge with late calcite veining in brittle fractures. Minor early pyrite in some shears. Minor unseparated diabasic intrusives. Some sections look more mafic than intermediate-felsic composition.									
64.5	67.5	Intermediate-felsic sill locally with mottled texture caused by percolation of fluid through small voids (leucocratic around the voids, melanocratic in the matrix in between). Semi-cohesive fault gouge from 64.5 to 65.5 metres. Much of the entire unit is bleached to the leucocratic light creamy grey-green and looks like chilled diabase (but is not).									
67.5	71.8	Medium green intermediate-felsic flow with local perlitic cracks and pseudofragmental textures. Minor hyaloclastic breccia, some of which resembles the BJ outcrop.									
71.8	76.1	Bleached, light beige-green intermediate-felsic intrusive. Abundant spherical to elongate-parallel vesicles, silica-filled; common leucoxene. Upper contact 40									

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS					
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
		degrees to core, some shearing. Resembles chilled diabase. Weak silica-sericite alteration, no pyrite.									
76.1	173.0	Heterogeneous mafic-intermediate hyaloclastic breccia characterized by a variety of angular clast types all of which have the same protolith. Incipient silica-sericite alteration (peripheral VMS footwall style). Clast varieties include 1) dark green-black sericitic-chloritic clasts, 2) grey-green intermediate clasts with elongate silica-(calcite)-filled voids/amygdules, 3) light green silica-calcite vesicular clasts, some of which look quite basaltic. All of these clast varieties can be seen to be mutually gradational with differences due to interaction with fluids. Perlitic cracks in some clasts. Generally aphyric but locally with sericitized plagioclase phenocrysts. Common fine leucoxene throughout. Rare speck pyrite but contains two anomalous splashes of chalcopyrite from 76.6-76.9 and again around 121m. This unit is the protolith of the altered units at the bottom of holes MM-294-4,5,6. Local leucocratic, siliceous introduction into matrix of hyaloclastic breccia. No sorting/stratification. 10cm late diabase around 102.2. Several diabase dykes and minor broken core from 111.3m-118.5m, some running along the core. Beginning around 124m, alteration increases marginally from incipient to weak and is accompanied locally by anomalous disseminated pyrite. Contains bleached, sericitized mafic clasts (some with trace anomalous green sericite)). Local specks chalcopyrite with common specks from 140m-165m, especially in amygdules of bleached clasts. Rare									

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS				
							Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
		speck/streak galena. Some clasts have bleached rims or partial rims. Local weak epidote alteration. Gradational basal contact.									
173.0	201.5	Weakly altered and pyritized mafic breccia unit; lithologically similar to unit above but contains a variety of weakly altered and pyritized clasts as well as 1% disseminated pyrite (much of which is dull, fine grained and distal-looking) in the matrix. Specks disseminated chalcopryrite locally. Some quite pyritized clasts and one large, isolated, massive pyrite clast (with semi-massive sections) from 187.3m-187.8m which contains trace chalcopryrite. Gradational and arbitrary basal contact.									
201.5	307.8	Basaltic breccia/volcaniclastic rocks as above 173m; fairly massive and homogeneous. Bands of amygdules in some fragments indicate a pillow breccia origin. Tight-packed, unsorted clasts, generally 2-10 cm but locally 30 cm. Incipient sericite-chlorite-calcite alteration with trace disseminated pyrite and common tiny specks of chalcopryrite (source of soil geochem anomaly). Alteration is patchy in bleached clasts and in lesser bleached zones. Rare dull, fine grained, distal-looking pyrite in the matrix. Calcite-(silica)-filled amygdules and small vesicles in scoriaceous fragments. Essentially non-magnetic (k = 0.03). Plagioclase are locally sericitized in bleached fragments. Rare 1-2cm synvolcanic shear is strongly sericitized. Alteration gradually increases from incipient to weak below 250 metres as chlorite in matrix becomes more evident. Local weak epidotization as well the more common									

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS					
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
		chlorite-sericite-calcite. From 280.0-286.0m is a massive, synvolcanic, intermediate composition sill with silica-calcite voids and common (1/2%) disseminated pyrite; lower contact is chilled and weakly sheared at 50 degrees to core. Moderate alteration and 2% disseminated pyrite from 288.5m-289.2m. From 292.4-292.6 is finely disseminated Zn-Pb-Cu associated with sericite-epidote alteration. More synvolcanic sills 288.9-299.4m and 300.6-301.1m. Alteration increases below 304.2m to moderate chlorite-epidote but with only minor disseminated pyrite; foliation 45 to 55 degrees to core becomes gradually more evident with depth. A few more minor synvolcanic sills toward the base of the unit. Fairly sharp basal contact is marked by increase in shearing and alteration.									
307.8	329.2	Deformation and intrusive zone with sections of altered and pyritized rocks. Overall, probably fairly significant fault movement.	294050	309.20	310.85	1.65	73	3.8	0.05	0.03	0.07
			294051	310.85	312.10	1.25	117	4.8	0.04	0.04	0.13
			294052	312.10	313.30	1.20	86	2.4	NIL	0.03	0.06
			294053	328.50	329.20	0.70	9	2.4	NIL	0.03	0.05
307.8	310.85	Pyritized, sericitized, fine grained, medium to dark grey-green rocks. Generally dark grey, comminuted, and displaying mesoscopic folds of earlier-foliated bands. Foliation varies from 30 to 90 degrees to core, generally 60 degrees to core. Rare trace chalcopyrite-sphalerite-galena. Contains several deformed intermediate sills, as seen near the base of the unit above.									
310.85	313.3	Medium yellowish green, foliated, sheared, strongly sericitized felsic(?) rocks. 1%-2%									

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LITHOLOGICAL DESCRIPTION			ASSAYS								
FROM	TO		SAMPLE No.	FROM	TO	WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
		disseminated pyrite and a few streaks and disseminations of base metal sulphide; trace barite. A few centimetre-scale semi-massive and massive pyrite bands. This unit may be a chilled, altered, marginal facies of the next unit.									
		313.3 329.2 Intermediate-(to felsic?) intrusive, similar to thinner units above. Fine grained, aphyric. Medium greenish, weakly sericitized and weakly foliated initially but becomes browner and medium hard through most of the unit. Browner more siliceous sections are brittly deformed and contain common epidote-filled fractures. Trace disseminated pyrite. Non-magnetic (k=0.0). Poorly developed quench fractures and some mottling of colours due to fluid movements. Probably synvolcanic. Gradually becomes greener and more sericitized and pyritized again towards basal contact - 328.5m-329.2m is 2-15% disseminated pyrite and resembles the pyritized unit in Hole #8 from 368m-378m. Weak shear at basal contact.									
329.2	337.14	Diabasic intrusive(?), characterized by mottled, moderate, early hematite alteration and laced with later epidote-filled brittle fractures. Weakly to moderately magnetic (k = 0.1 to 0.8). Looks basaltic in part (but probably is not) with local calcite amygdulcs. Post-mineralization, but contains a few deformed streaks of high grade, remobilized base metal sulphide toward the base.	294054	336.74	337.14	0.40	5898	212.5	0.06	2.90	5.10
337.14	337.50	Massive sulphide - very high grade. Possibly a "vein" which has been remobilized into the intrusive bodies.	194103	337.14	337.50	0.36	15500	140.0	0.27	6.09	46.40

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS					
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
		Streaky-banded (sheared) with fine-grained, blue-grey Buchans-style sections on the top and bottom of the unit and massive light brown sphalerite (with streaks galena-chalcopryrite) in the centre. Estimate 30% Zn, 10% Pb, 1% Cu. Upper contact 45 degrees, lower contact 20 degrees to core axis.									
337.50	339.13	Massive, medium green fine grained diabase. Unmineralized except for a single 6 cm remobilized vein(?) (or a screen?) or xenolith(?)) of blue-grey very high grade Zn-Pb.	194104	337.50	339.13	1.63	810	18.8	0.01	0.61	1.17
339.13	346.37	Massive Sulphide	194105	339.13	339.61	0.48	20900	168.0	0.27	6.65	42.70
			194106	339.61	340.36	0.75	3330	157.0	0.05	3.11	11.10
			194107	340.36	341.05	0.69	1180	230.0	0.03	3.37	25.10
			194108	341.05	341.86	0.81	871	113.0	0.02	0.51	2.46
			194109	341.86	342.74	0.88	2740	104.0	0.48	0.21	9.61
			194110	342.74	343.50	0.76	1820	272.0	3.32	0.02	0.23
			194111	343.50	344.39	0.89	3180	211.0	2.26	0.53	0.92
			194112	344.39	345.14	0.75	5550	53.7	0.38	3.62	11.90
			194113	345.14	346.37	1.23	5040	28.0	0.44	0.17	8.31
		339.13 339.61 Banded very high grade massive sulphide; banding 45 to 65 degrees to core. Brown sphalerite with blue-grey Buchans-like sections. Brown sphalerite is altered/stained blackish along hairline brittle fractures.									
		339.61 340.36 Deformed, pyritic massive sulphide interspersed with a few bands of mineralized lithic material. Banding 55 to 70 degrees to core. 10% combined base metals in discrete high grade bands.									
MINERALIZED ZONE: Mass. Sulp & Diab Core Angle: 90 True Width: 9.63											
				336.74	346.37	9.63	4184	122.1	0.64	1.68	10.11

340.36 341.05 High grade massive sulphide; some sections are pyritic, higher grade sections are not. Banding 50 to 90 degrees to core. Minor baritic bands.

NB These should be 294104 etc see XRAY certified

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS					
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
	341.05	344.39	Deformed massive pyrite with fine disseminated chalcopyrite and generally low grade Zn-Pb. Some unusual, 1mm, ellipsoidal chalcopyrite "spots." Banding at various angles to core with suggestions of folding locally. Comminution of pyrite locally. Minor barite and sericitized lithic material. Some sections containing fine chalcopyrite are very conductive.								
	344.39	346.37	Semi massive to massive sulphide - good grade Zn. Abundant sericitic and silicic lithic material. Foliated 55 degrees to core. Progressive brittle shear towards the base with friable core and minor fault gouge.								
346.37	346.77	Fault gouge with less than 1% base metals. Barely cohesive.	194114	346.37	346.77	0.40	676	13.6	0.02	0.34	0.79
346.77	348.5	Synvolcanic(?) intermediate-felsic intrusive(?) resembling similar units above the massive sulphide. Tan brown to greenish colours. Moderately broken core. Mottled medium to dark greenish colours with minor browner more silicic sections. Some dark fracture-fills. May correlate with cherty rhyolite at bottom of Hole #9.									
348.5	358.45	Variably sericitized, intermediate-felsic lithology (possibly a facies of the intrusive unit above or possibly a flow). Generally weak-moderate sericitic alteration, with less than 1% disseminated pyrite and a few									

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS				
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)
		streaks/disseminations of base metal sulphide (especially from 357.4 to 358.45). Some quench fractures and perlitic cracks and related pseudofragmental textures. Minor plagioclase laths. Minor brittle and ductile shears. Some sections are identical to lithic sections in the massive sulphide body. Weak shear at 75 degrees to core at base.								
358.45	362.2	Pyritic siltstone and related altered tuffaceous wacke and re-sedimented, altered breccia units. Essentially identical to Buchans "pyritic siltstone." Medium to dark grey-green. Medium-soft, nowhere cherty. Bedding locally at 50 to 70 degrees to core. Several series of excellent graded beds, tops upright. Fine disseminated pyrite throughout with local specks Zn-Cu. Basal contact is cored and does not appear to be a shear of significance.								
362.2	482.0	Altered felsic flows with sections of possible synvolcanic felsic intrusive.								
		362.2 401.1 Strongly sericitized felsic flow or synvolcanic intrusive(?). Medium yellowish green sericite with 1%-2% disseminated pyrite (resembling the yellowish green sections in units above). Minor sections of vermiform silicic alteration. Heterogeneous on a hand specimen scale, but homogeneous on a larger scale. Local traces sphalerite. Minor semi-massive to massive pyrite seams, on a 10 cm seam at 377m. Moderate shearing in the first half metre. Foliated 55 to 65 degrees to core. Local pseudofragmental textures. Local								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS					
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
		plagioclase phenocrysts, trace coarse leucoxene. Yellow-green colouration decreases somewhat with depth though alteration remains strong. Fault gouge and friable altered/pyritized rock from 399.1 to 401.1m.									
401.1	426.5	Light to medium greyish green felsic flow, more leucocratic, more altered and more pyritic than the unit above - strong alteration throughout. Variable pyrite content from 1% to 3%, occasional pyritic stringers, rarely to 10 cm width. Rare trace Zn-Cu. Common pseudofragmental textures - some "fragments" have darkened rims. Minor plagioclase laths.									
416.1	416.3m	is dark, pyritic, clayey fault gouge at 25 degrees to core. Minor broken core at basal contact.									
426.5	457.7	Moderately strongly altered felsic flow, with more advanced pseudofragmental textures and considerable light-dark mottling. Overall darker colouration than the unit above but less pyritic. Elongate, melanocratic, sericitic entities resemble "pumice;" core angles generally 25 to 45 degrees to core. 50 cm dark grey black, siliceous fault gouge at basal contact.									
457.5	482.0	Light-medium greenish to beige, altered felsic synvolcanic intrusive or flow(?). Moderate sericitic-silicic alteration (i.e., slightly less altered and more massive than units above). Local black, irregular hairline fractures. Occasional cm-scale stringers/fracture fills of									

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS				
						WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)

pyrite. No base metals but local specks barite. Common medium-grained leucoxene specks. No phenocrysts evident. Local well developed flow banding with silicic alteration invading along fractures between bands; banding is generally less than 45 degrees to core.

482.0 metres EOH, 120 NQ core trays
Casing left in hole.

Tropari tests:
at 200 metres: 41 degree dip at 139 degree true azimuth
at 420 metres: 40 degree dip at 148.5 degree true azimuth
Hole is lined to the bottom with small PVC pipe (48mm OD, 40mm ID).

Assay Samples: 294050 to 294054 and 294103 to 294114

Lithogeochem samples @ 91.5m, 326.7, 332.8, 335.2, 348.2, 366.9, 383.5, 409.7, 450.2, 475.7m

DOWN-HOLE SURVEY DATA

DEPTH	INCLINATION	BEARING
200.00	-41.00	189.00
420.00	-40.00	198.50

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FROM	TO	LITHOLOGICAL DESCRIPTION			SAMPLE No.	FROM	TO	ASSAYS					
								WIDTH	Au (ppb)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)
		DEPTH	INCLINATION	BEARING									
		482.00	-39.00	200.00									

HOLE No: MM294-7