

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE

HOLE No.: GB-145

Collar Eastings: 637.00

Collar Northings: 7000.00

Collar Elevation: 0.00

Collar Inclination: -64.00

Grid Bearing: 80.00

Final Depth: 601.07 metres

Logged by: M. LENTERS, M. THICKE

Date: FEB. 14, 1991

Down-hole Survey: TROPARI

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FRCA	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
0.00	15.85	OB Boulders, gravel and mud.							
15.85	18.40	CHERT Broken fragments and blocks. Same as interval 19.00 - 20.35m.							
18.40	19.00	MAFIC DYKE Broken fragments and blocks. Same as 20.35 - 20.85m.							
19.00	20.35	CHERT Medium red-purplish, very hard, v.f.g., massive but intensely fractured/veined with 2 generations of qz veining giving unit a pseudo-breccia appearance. No foliation apparent and no lamination or bedding - possibly due to intense veining throughout. Very weak to weakly magnetic. Intensely broken core, generally into 1 - 2cm fragments. Lower contact sharp, irregular. Note: hole cemented to 38.71m. Unit cut by at least 3 generations of veining (2 dominantly silica, latest calcite). First 2 generations of veining seem to be related and may only be 2 styles of one generation as both locally x-cut one another; one style is dominantly thin to thicker (1 - 10mm), somewhat subplanar to lamination/bedding, but locally irregular and contorted while silica veins that enhance the bedded appearance of the unit; the 2nd style is thin (< 2mm) more intense network fracturing with white to slightly yellowish silica + carb? veining; in this unit this latter has a greenish colour (epidote) and in the zone between several parallel fractures at 30' to CA between 19.80 - 20.05m, is intensely developed into pseudo-breccia zone. Unit exhibits about 20% silica veining. About 5% yellow to green epidote and/or carb, as well as coarsely crystalline calcite veining locally cut silica veining. No visible sulphide mineralization.							

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 2

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
20.35	20.85	MAFIC DYKE (DIABASE)							
		Late dyke, same as 18.40 - 19.00. Dark green aphanitic - f.g., massive, moderately hard, moderately - strongly magnetic. Mafic composition. Core moderately competent but well broken with contact zones poorly recovered although sharp irregular chill margins seen on some frags. Contact orientation not discernable.							
		Minor (1 - 2%) thin, discontinuous, tension fracturing silica veinlets. No visible sulphides.							
20.85	44.85	FERRUGINOUS CHERTS and ARGILLACEOUS/TUFFACEOUS CHERTS	27404	27.50	31.00	3.50	1	28	24
			27405	31.00	32.50	1.50	93	40	22
			27406	42.35	43.85	1.50	4	34	38
		Medium reddish to purplish and locally slightly purplish grey, aphanitic to v.f.g., generally well bedded to laminated; lamination/bedding at mm to cm scale, locally subparallel at 45 - 60° CA but mostly irregularly folded and contorted over 10 - 50cm with both small (1 - 10cm) scale and medium (10 - 50cm) scale wavelength and amplitude folding, locally to both sides from CA. Folding highly irregular with both sinistral and dextral fold orientations apparent. Laminations are mostly hair-line to 2mm in width and consist of light grey (ash tuff?) to black (argillite?) laminations in dominantly ferruginous chert. Composition dominantly siliceous though minor Fe and/or Mn? - most cherts at Gullbridge are more Mn-rich. Foliation not generally apparent, but in some more tuffaceous/argillaceous laminae and beds foliation appears to be parallel to bedding and defined by platy minerals. Above 35m non-magnetic, below 35m weak to locally moderately magnetic. Lowermost part of hole more laminated (tuffaceous/argillaceous) section below about 40.50m and includes a few thin (1 - 3cm) felsic tuff bands e.g. 43.90 - 43.93m and 44.13 - 44.16m. Moderately broken and fractured core with several rubbly broken sections. Hole cemented from surface to 38.71m. Lower contact somewhat gradational but taken at change from dominantly cherts above, to porphyroblastic (spotted) felsic meta-volcanics below. Relatively unaltered. Moderately veined similar to narrow chert section of this unit above dyke. Numerous lighter coloured bands or veins parallel to bedding probably thin felsic tuff bands; generally uniformly 1 - 5mm wide and exhibit very small scale parasitic-type folding. 5 - 15% small scale irregular to network							

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GR-145

Page 3

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
		crackle-fracture filling as well as pygmatic folded to subplanar white f.g. silica veins; these have various generations cutting one another, and are more concentrated in the competent cherts rather than argillaceous/tuffaceous cherts. Later veins include irregular but more planar and defined yellow to greenish ep ± carb fracture veining (2 - 3%) locally forming small (1 - 5cm) fracture bounded lenses and anastomosing concentrations of thin veinlets; where planar commonly 30° CA.								
		Minor visible Fe-sulphide often concentrated as very fine disse along thin laminae.								
44.85	136.55	VARIABLY HORNFELSED/ALTERED FELSIC METAVOLCANICS (RHYOLITE)	27407	51.00	52.80	1.80	1	14	26	670
			27408	52.80	52.95	0.15	4	36	34	390
			27409	56.70	58.00	1.30	1	26	32	690
			27410	107.00	108.00	1.00	1	14	30	1000
			27411	108.00	109.00	1.00	1	12	28	1170
			27412	121.00	122.00	1.00	1	16	28	710
			27413	168.00	170.00	2.00	1	4	28	910
			27414	192.80	195.00	2.20	1	12	36	780

Variably mottled, pastel coloured, generally f.g., very siliceous, porphyroblastic felsic metavolcanic. Strongly hornfelsed/alterd generally with a schistose qz ± sc matrix, locally grading into more brecciated rhyolitic sections that appear somewhat less altered, much less foliated and non-porphyroblastic. The foliated/schistose zones contain abundant (15 - 25%) large (0.5 - 2cm) ragged porphyroblasts giving much of the unit a spotted (hornfelsed?) appearance. To 68m unit has characteristics indicative of a coarse conolithic felsic pyroclastic (lapilli tuff), however this unit grades into other more rhyolitic sections and it appears that the whole unit is a variably altered/hornfelsed autobrecciated rhyolite flow/intrusive (?).

Unit is divided into zones with slightly different appearances/characteristics - note that this is one felsic metavolcanic unit and that divisions are very gradational and commonly occur within each other.

44.85 68.00 Porphyroblastic Hornfelsic Metavolcanic (Lapilli Tuff)

Very irregular, coarsely patchy or mottled colour section exhibiting pastel shades of purple, bluish grey, grey, buff, cream, grey-green and sericitic green, with local salmon pink (orange) to reddish orange patches. Very f.g. to f.g. foliated matrix, but including rhyolitic "frags" with relatively unaltered qz-fp phytic rhyolitic composition; rhyolite frags are purplish grey, aphanitic, massive, non-magnetic with 5% small (0.5 - 2mm) subround qz phenos(?) - possibly clusters of dominantly silica. Section appears to have characteristics of a near vent fragmental or coarse lapilli tuff locally consisting of 10 - 30% coarse

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 4

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

11 - 15cm subangular, sharply bounded, massive rhyolite frags in an altered felsic groundmass. Rhyolitic frags are monolithic. Groundmass variably banded/patchy intergrowths of variably altered felsic volc material with a qz-sc ± minor carb composition, overprinted by 15 - 25% large (0.5 - 2cm) ragged-edged, diffuse poikiloblastic porphyroblasts. Poikiloblasts tend to be oriented subparallel to foliation, but locally overprint earlier alteration and also form in certain groundmass compositions. Porphyroblasts appear to be poikiloblastic silica-carb-cordierite(?) growths visible as slightly darker green/brown spots, but locally are reddish due to hematitic staining. Section moderately well foliated ± 60° CA, varies from 45° - 70° CA. Moderately hard, with some softer sections (carb/sc alteration?) - rhyolite frags very hard. Section non-magnetic. Well fractured and broken with several rubbly sections. Section gradational into lower division.

Felsic(?) dyke 73.80 - 74.35, purplish-grey, aphanitic, non-magnetic, hard, chill margins; 2 - 3%, 2 - 3mm salmon pink sp phenos and 5% round qz amyg/phenos. Poor core recovery prohibits contact measurement. No visible sulphides. Moderately to intensely silicified and lesser sc ± carb alteration. Uniform alteration over large width suggest alteration may be regional metamorphism or large scale hornfelsing. 2 - 4% very late, hairline to 1mm, planar, offset, branching, anastomosed to irreg networking fracture filling, salmon pink carb veinlets - may be related to granitic intrusives (Topsails or Twin Lakes) as cut porphyroblasts. Minor to 3%, diffuse, planar to blebs grey-white qz veins/patches - more common and better developed in rhyolitic frags. Late planar fractures throughout are coated with sc.

Minor finely disseminated sulphides. Local intensely altered patches contain finely disseminated purplish black mineral which looks like magnetite (non-magnetic) - possibly specular hematite.

68.00 - 86.00 Hornfelsic Metarhyolitic Tuff
Similar to above but progressively fewer coarse rhyolite frags. Consists mostly of well foliated, variably coloured, porphyroblastic qz-sc schistose material, generally same as above. 20 - 35% porphyroblastic development same as above. More homogeneous f.g. felsic composition indicates that original unit may have been a finer lapilli or st tuff unit, or well altered autobrecciated rhyolite (same as below). Non-magnetic and has composition

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 5

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

and veining characteristics as above. Moderate to intense silica alteration/hornfelsing. Foliation @ 50° - 55° CA. Lower contact gradational.

Minor very finely disseminated py.

86.00 - 106.00 Hornfelsic Porphyroblastic Metarhyolite Flow
Patchy to mottled pastel greys, creams and greys, aphanitic, non-magnetic, massive to weakly shear foliated and locally weak to moderate schistose/foliated at 55° - 60° CA although ranges 30° - 70° CA. Qz - sc and lesser carb and chl composition. Massive sections appear to be an autobrecciated rhyolite though more foliated sections do not give any indication of protolith - these are felsic in composition and may represent f.g. autobrecciated matrix material of a flow breccia or shear foliated rhyolite or even a felsic tuff. 5 - 25% small (0.5cm) to larger (2cm) ragged diffuse foliation subparallel porphyroblasts occur throughout section, but more commonly in f.g. foliated quartzose material, and less common in more massive rhyolite. These are commonly streaked parallel to foliation. Section relatively broken into 2 - 15cm pieces along fractures. Small fault breccia zone 35' CA at 98.90 - 99.00m rehealed with salmon pink carb.

Rhyolitic sections weak pervasive altered, generally have distinct contacts but locally grading into more foliated sections; more massive rhyolite generally has fine-scale intense pseudobrecciated appearance caused by intense (5 - 15%) network fracturing of silica veinlets. 5% somewhat planar, irregular to discontinuous fracturing with salmon pink to whitish carb in veinlets/tension fractures up to 3mm. Numerous planar sc fracture slips at 35° - 50° CA. 2 - 3% thin (1 - 5mm) somewhat diffuse qz veins with gradational (flood) boundaries.

Very minor finely disseminated sulphides and black (hematite) mineral.

106.00 - 166.00 Porphyroblastic Felsic Metavolcanic - Rhyolite Flow/Tuff

Coarsely mottled to patchy pastel greens, buffs and greys with light sericitic green-grey dominant. Generally f.g. though granular, moderately foliated @ 40° - 50° CA, foliation more irregular below 150m avg 40° - 45° CA with sheared brecciated zone between 164 - 165m @ 20° - 25° CA. Siliceous composition with sc and possibly minor carb and chl. 15 - 25% porphyroblasts, 0.5 - 3cm diameter, irregular to ragged, anhedral, locally elong-parallel to foliation, locally coalesce forming patchy inter-

RTO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 6

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
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growths, generally darker brown or green than groundmass and have diffuse appearance as if only partially formed, most are probably poikiloblastic growths of various minerals but are very hard with silical(?) predominant, locally a few porphyroblasts bright red due to hematization, locally few green porphyroblasts have sharp boundaries and appear clast like. Granularity of unit indicates it may have been a thick felsic metavolcanic tuff accumulation, but compositional homogeneity over such thicknesses, as well as similarity to "overlying" sections, indicate it is likely an altered rhyolite flow/intrusive. Only locally are there small, 1 - 5cm more massive aphanitic rhyolite patches which grade into more schistose zones. Few massive, brecciated pinkish rhyolite zones particularly from 144 - 146m, 154.50 - 155.00m, 162.00 - 163.65, all with gradational contact zones except bottom of last zone which is sharp. Numerous zones of sheared brecciated rhyolite (e.g. 164 - 165m) - small (< 1cm), angular rhyolite with sharp boundaries in sheared matrix of same composition. Unit is non-magnetic. Hackly breakage across across foliation with very fine sugronic texture, along with porphyroblasts, indicates hornfelsing. Small fault breccia with salmon pink carb veining @ 45° CA and subparallel to foliation at 107.97 - 108.00m, 0.5cm mafic dykelets at 40° CA, subparallel to foliation at 113.50.

Moderate to intense pervasive silicification and weak to moderate sc alteration, minor carb and chl alteration - all possibly a function of hornfelsing. 1 - 3%, small (1 - 10mm) somewhat planar but locally irregular, grey qz veining with fairly diffuse edges which may suggest vein development during thermal metamorphism. Locally these form larger (0.5 - 3cm) irregular patches. Core moderately broken with numerous (10 - 100cm spacing), thin (1 - 3mm) generally low angle (20° - 45° CA), subplanar chl/sc slip planes - note fewer salmon pink carb fracture filling than above, more concentrated in local bands/zones. Carb filling locally layered and often breaks out from fractures as irregular plates/pieces. Few short (< 1m) rubbly zones, particularly below 160m.

Trace finely disseminated sulphides, and locally finely disseminated specular hematite.

166.00 - 196.55 Brecciated Rhyolite - Shear Foliated Rhyolite
Similar to above but with 10 - 15% 0.5 - 1m sections of brecciated rhyolite, and more homogeneous, well foliated qz - sc zones that are less distinctly porphyritic. Larger rhyolite zones occur from 166.05 - 167.25m, 170.55 - 171.00m, 187.00 - 188.00m, 193.00 -

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 7

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189.50. Rhyolitic zones generally grade into more schistose zones and are mottled light grey to salmon pink, aphanitic, massive to weakly foliated, often with a shear foliated and/or brecciated appearance; foliation very planar and consistently 45° - 50° CA throughout; often cut by 5 - 20% white, irregular network, criss-crossing, thin (1 - 5mm) qz veins which appear to crosscut fractures in brittle deformed, very hard rhyolites. Schistose zones pale buff-grey to medium grey, f.g. granular, weak to well foliated/schistose qz-rich rock; could be shear foliated rhyolite or very homogeneous siliceous tuffs; section relatively uniform or similar in character throughout; hard and magnetic. Composition dominantly quartzose with sc and minor chl; no bi. No distinct porphyroblastic and hornfelsic (silicified) appearance of overlying unit although 5 - 15% porphyroblasts occur locally over 0.5 - 1m with similarities to above. Unit very siliceous, lower contact @ 45° CA.

Qz sc schist 192.50 - 196.55m, medium grey, very uniform, granular well foliated, no porphyroblasts. Possibly a felsic tuff. Foliation 40° - 50° CA with 5 - 10% thin (hair line to 2mm), grey qz veinlets subparallel to foliation and at 70° - 80° CA across foliation. Very clean, no Mg/Fe content.

Moderately to intensely silicified, moderately sericitized. 5 - 15% silica as large white qz veins and patches and abundant small (hair line to 2mm) planar to network veining locally giving an intensely qz veined fractured appearance. Local sections (e.g. 168 - 178m) appear intensely pseudo-brecciated due to 20 - 30% fine scale qz veining/flooding. 3% thin (1 - 5mm), orange calcite or late planar fracturing at various angles to core axis, commonly 20 - 45° CA. Late calcite - ep filled fracture at 185.90 - 186.80m at 40° CA. Section relatively competent but moderately broken along foliation and fracturing.

196.55 209.60 BRECCIATED RHYOLITE

Intensely broken (brecciated) and qz veined flow. Variably patchy coloured medium purplish grey to buff to salmon pink, aphanitic, non-magnetic, massive to locally very weakly foliated. Few thin (10 - 30cm), light grey, granular schistose bands zones as in directly overlying section - sharply bounded @ 35° - 50° CA. Hard, competent but moderately broken along fractures. Lower contact relatively sharp @ 40° CA.

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 8

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

Intensely qz veined/flooded with up to 20 - 40% qz. Qz veining occurs as an "early" intense network fracturing with somewhat diffuse boundaries, locally flooding host rock and everywhere giving unit a pseudo-brecciated appearance. Veining occurs at all scales from microscopic to several cm's. Veining generally wavy to irregular. No late planar qz veining. St late green ep or salmon pink to reddish carb veining on hair line to a few mm sub-planar fractures or anastomosing fracture bands at various angles to CA but generally 10° - 45°. Large late, vuggy fracture at 199.65 - 199.90 at 25° CA.

No visible sulphides.

209.60 221.05 QUARTZ SERICITE SCHIST - Shear Foliated Rhyolite/Tuff

Light to medium grey-green to creamy brown/buff, relatively uniform section of fine-grained (<1 mm) moderately hard, non-magnetic moderately shear foliated/schistose rock. Locally with weak silica banded appearance, with alternating, 1-2 mm wide silica and schistose laminae.

Generally quartz-sericite:minor carbonate? composition with some chlorite. Much of unit has a fine (1-2 mm) shear foliated, pseudo-brecciated appearance with up to 50% small (1-3 mm), foliation parallel, elongate quartz and aphanitic rhyolite fragments in anastomosing foliated matrix.

Locally, the unit also contains short (10-30 cm) intervals that are harder and aphanitic and have a massive rhyolitic flow appearance as in the over and underlying units.

Very clean, quartz-sericite schist with no Fe/Mg content or addition.

Foliation throughout unit varies but is generally at a low angle to the core axis (10-35° CA) in the lower half and 45-65° to CA in the upper half. Foliation is somewhat microfolded or crenulated and locally exhibits small (1 cm x and amplitude) folding.

Massive rhyolitic sections and various schistose quartz-sericitic zones grade into one another over short (<10-20 cm)

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 9

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
		intervals.							
		Two small (<50 cm) patches exhibit minor to 10% weakly developed large, ragged porphyroblasts which are common in upper part of this hole.							
		Locally exhibits thin zones of small (2-5 mm) subvoid, foliation parallel darker grey silica porphyroblasts or possibly silica amygdulæ. Locally these coalesce to form wormy intergrowths.							
		The more massive rhyolitic sections exhibit 5-15% irregular to network, small to larger (<1 cm) diffusely bounded, milky grey, quartz veining/patches/flooding. Veins are not planar but undulate in all directions across foliation and are discontinuous to patchy.							
		Quartz-schistose zones exhibit 5%, small (1-5 mm), discontinuous, foliation parallel wormy quartz veinlets, and minor planar quartz veinlets cross-cutting foliation.							
		Trace very finely disseminated pyrite.							
		2-3% small (hairline to 3 mm), late, salmon pink to light brick red carbonate : silica on subplanar fractures at various angles to CA (much less than upper part of this hole).							
		Unit hard and competent with 20-50 cm breakage on fractures. Lower contact relatively sharp at ~ 40° CA.							
223.05	230.60	RYHOLITE (Brecciated)	27415	229.00	230.60	1.60	10	18	16

Same as 209.60-223.05 metres.

Includes several small (<10 cm) schistose bands and one larger dark grey quartz-sericite schist zone that occurs between 224.50 to 225.41 m, with foliation oriented at ~ 30-70° CA, with ~ 50° at top, 70° in central and 30° at lower end.

Unit exhibits abundant quartz veining and late epidote-carbonate fracturing as in rhyolite above (209.60-223.05 m) giving unit a moderately brecciated appearance. Late hairline fracturing has pale green epidote fracture filling more

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 10

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
		prominant than the salmon-pink carbonate filling.								
		No visible sulphides, but locally minor fine disseminated specular hematite mineralization.								
		Hard relatively competent core with 50-100 cm breakage.								
		Lower contact relatively sharp but very irregular at ~ 30° CA.								
230.60	245.85	FELSIC METAVOLCANIC TUFF - Quartz-Sericite Schist	27416	243.00	245.00	2.00	32	16	30	900
		Includes several thin ferruginous chert beds.								
		Similar to 209.60-223.05 m, but including definite fine-grained tuffaceous horizons as indicated by the included chert bands, on a local quartz eyes and glass shards near bottom of this unit.								
		Non-magnetic.								
		Chert bands/fragments are dark hematitic red, thin, broken, and oriented parallel to foliation; they could be small chert beds within the tuff, now broken by later tectonism, or possibly they are chert fragments/blocks within tuffaceous sequence as rip-ups of underlying thick chert sequence. (However, quartz-sericite schist does not contain any small (<1 cm) chert fragments other than the irregular beds/bands noted below: Chert horizons are non-magnetic though purplish red colour denotes some Fe content, probably as hematite.)								
		230.60-231.12 Fine-grained, grey felsic metavolcanic tuff; (quartz-sericite schist); locally weakly (slightly) laminated.								
		231.12-231.18 Small, irregular, somewhat broken/brecciated hematitic medium chert band @ 40° CA; locally the broken segments/fragments of chert band infilled with quartz-sericite schist (tuffaceous material) from the wallrock.								
		231.18-231.72 Fine-grained, grey to creamy brown, felsic metavolcanic tuff (quartz-sericite schist); weakly foliated at 60° CA.								
		231.72-231.92 40% thin (2-20 mm) red chert bands or fragments								

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GH-145

Page 11

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						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
		of bands subparallel to foliation, occurring within felsic metavolcanic tuff (quartz-sericite) as above and below. Chert fragments somewhat folded and oriented between 20-40° CA.								
	231.92-232.42	Very fine-grained, creamy brown, laminated quartz-sericite-carbonate? unit (ash tuff?) including 5-10% fine (1-5 mm) planar to pyroclastic clear, grey quartz veinlets.								
	232.42-232.56	Interbanded red/purplish chert and quartz sericite schist as above; bedding at 60° CA.								
	232.56-234.60	Massive to weakly, but irregularly foliated, mottled and patchy varicoloured buffs, grey-green, pastel purple coloured, rhyolite or silicified rhyolitic tuff. Foliation at ~ 40° CA. Locally exhibits small (1-3 mm) foliation parallel, elongate, ovoid silica amygdulites or possibly phenocrysts. Unit is more massive and thus more (5-10%) quartz veined (pseudo-brecciated) than tuff sections within this unit. Quartz-veining irregular with diffuse contacts.								
	234.60-235.15	Chert - irregularly interbanded dark hematitic red chert and grey chert with lesser grey ash? tuff; unit exhibits thin bands of subrounded, 1-10 mm, elongate chert & tuff fragments suggesting fragmentation and redeposition of chert horizons. Bedding/banding/foliation somewhat irregular and locally swirled on a small (cm) scale, but averages 50-60° CA. Non-magnetic. Lower and upper contacts @ 60° CA.								
	235.15-237.00	Shear foliated (autobrecciated?) rhyolite or rhyolite tuff (similar to parts of 44.85-196.55 m except not hornfelsed/porphyroblastic). Mottly coloured as overlying rhyolite section (232.56-234.60 m), but weak to moderately foliated at ~45° CA, with a shear foliated/brecciated appearance of abundant (up to 50%) small (1-5 mm) subangular rhyolitic "fragments" in anastomosing "shear?" banded foliation. "Fragments" are not distinct and grade into surrounding shear foliation and section contains several more massive rhyolitic sections.								
	237.00-245.85	Fine felsic metavolcanic locally welded coarse ash tuff (quartz-sericite schist); includes rhyolite fragments/blocks?								
		Mostly medium-dark grey, fine-grained (4 mm), relatively								

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 12

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
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		homogeneous tuff unit; has quartz-sericite composition; non-magnetic.							
		Includes a few, short (10-50 cm) of somewhat more massive rhyolite sections as typical in upper units (44.85-196.55 m). In this unit, these have somewhat more defined and sharper contacts and could be large rhyolitic blocks or felsite dykes; these exhibit minor feldspar phenocrysts and are brecciated by 10-20% quartz veining and 5% late epidote fracturing as is typical in this rock type in this drill hole.							
		Foliation varies from 40-60° CA in schistose tuffaceous part of this section; locally these schists contain vague, larger lapilli and between ~ 241 and 244, there are irregular, concave cuspid small 1 x 1-5 mm, siliceous fragments that appear to be glass shards of a welded tuff. This section also exhibits very vague, relict? blue quartz eyes.							
		This unit as a whole has quartz-sericitic composition; rock is moderately hard, but not hornfelsed (fine-grained, porcelain-like and porphyroblastic) character of uppermost felsic (rhyolitic) flows/tuffs (44.85-196.55 m).							
		Unit contains 5%, small 1-10 mm subplanar to slightly wavy (ptygmatic) and locally slightly offset, quartz veining with diffuse contacts. Locally rhyolitic sections are more intensely and irregularly quartz veined.							
		Unit exhibits 2-3%, thin (hairline-2 mm) late fracturing with epidote or orange-hematitic carbonate coatings; the latter are irregular and again concentrated in more brittly deformable submassive rhyolitic sections.							
		Unit as a whole is relatively competent (not as broken or fractured as upper felsic rhyolitic flows/tuffs), with 25-100 cm breakage on fractures.							
		No visible Fe-sulphides.							
		Lower contact sharp, but very irregularly swirled and small scale (mm) folded. Cherts just below contact oriented at 45° CA.							

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 13

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
245.85	258.70	RED FERRUGINOUS CHERT, GREY CHERT AND MINOR ASH TUFF AND REDEPOSITED COARSER TUFF & CHERT HORIZONS	27417	253.00	254.00	1.00	1	80	66
			27418	258.00	258.65	0.65	1	38	56

80% well bedded and laminated, hematitic red to purplish grey cherts and argillaceous cherts, and lesser white to grey chert and tuffaceous cherts, light grey ash tuffs, and a redeposited chert/tuff fragmental beds.

Cherts are aphanitic to very fine-grained, non-magnetic, hard where very siliceous to moderately hard where argillaceous. Several beds exhibit broken cherty and tuffaceous fragments in finer-grained matrix suggesting some redeposition of cherty horizons within this unit. Graded bedding, rip-up clasts and scours generally (40%) indicate that tops are uphole. A few minor, small scale folds indicate synform downhole.

Bedding and laminations are variable throughout unit due to minor folding, ranging from 0-60°, but averaging 40-45° CA.

Cherts locally cut by St, very thin (hairline-2 mm), planar but offset/stepped/21g-22g silica veining & network veining generally with distinct contacts (brittle fracturing).

Minor late white calcite and salmon pink carbonate-calcite fractures and thin faults. Thin fractures at various angles to core axis, but larger bands subparallel to bedding as follows:
249.19-249.20 m - late fracture with brecciated wallrock fragments; and salmon pink carbonate matrix @ 48° CA.
249.90-249.96 m - same as above.

No visible sulphide mineralization. Very fine silvery specular hematite grains visible in some purplish chert/argillaceous chert bands.

Major lithology sections in this unit as follows:
245.85-246.10 m - red argillaceous chert @ 45° CA.
246.10-246.70 m - grey chert/ash tuff @ 55° CA.
246.70-248.70 m - redeposited/reworked red chert with small (<1 cm) chert & tuff fragment bands & beds as well as finer sandy to argillaceous beds/bands @ 35-55° CA.
248.70-250.40 m - 60% red chert & fine-grained argillaceous chert interbedded with 40% light grey ash tuffs and lesser grey cherts; bedding @ 40-55° CA.
250.40-258.70 m - mostly red argillaceous chert, interbedded

RIO ALGON EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 14

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
		with minor grey tuffaceous chert beds; bedding more irregular/folded than overlying sections but averages $\approx 30^\circ$ above ≈ 56.00 m and 50° below 56.00 metres.							
		Lower contact sharp but highly contorted/irregular at $\approx 45^\circ$ CA; lower part (1 m) of chert is more intensely network silica veined including several thin pygmaic folded veinlets.							
258.70	260.10	PELSIC METAVOLCANIC COARSE ASH TUFF - Quartz-Sericite Schist AND CHERT							
		Medium grey to green-grey, fine-grained, generally non-magnetic, moderately but irregularly foliated tuffaceous unit similar to some interbed horizons in overlying chert unit.							
		This unit contains thin grey cherty horizon between 259.50 - 259.90 m that grades into magnetic reddish chert band between 259.90 - 260.10 m.							
		Upper tuffaceous section moderately well foliated at 30 - 45° CA, but well banded with wavy (pygmaic), grey silica veinlets/bands parallel to wavy foliation. This section also includes minor discontinuous, boudinaged quartz veining subparallel to CA.							
		Quartzose-sericite-chlorite composition with greener colour of this tuff probably due to chlorite.							
		No visible sulphides.							
		Moderately competent core, with 15 - 30 cm breakage generally parallel to foliation.							
		Lower contact gradational.							
260.10	262.75	INTENSELY SILICIFIED MAPIC METAVOLCANIC	27419	260.10	261.50	1.40	51	8	64
			27420	261.50	262.75	1.25	76	10	70
		Dark grey-green to green-black, fine-grained, massive to weakly foliated, but with 20 - 30% irregular mottled/patchy light green epidote-silica alteration.							250
		Unit is very hard and pervasively moderately silicified, giving							200

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 15

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

composition/texture a subdued appearance. Appears to originally have plagioclase and mafic ferromagnesian mineralogy, but now fine plagioclase, chloritized mafic minerals and 5-10% fine-grained magnetite/hematite is visible.

Locally within epidote altered patches, the unit has fine-grained, siliceous, appearance not unlike some rhyolitic sections in this hole suggesting this unit could possibly be intensely epidotized & chloritized felsic rhyolite? originally similar to underlying unit.

20-30% epidote-silica alteration occurs as pervasively altered irregular, but somewhat foliation parallel patches, as well as later epidote dominant fracture veins and bands. Foliation and alteration banding oriented at $\pm 50-55^\circ$ CA. No late quartz veining.

No visible sulphides.

Competent core with breakage across foliation.

Lower contact gradational.

262.75 269.90 FELDSPAR PHYRIC RHYOLITE FLOW/INTRUSIVE

Medium to dark pinkish brown to purplish brown, generally massive and aphanitic to locally weakly schistose, hard, siliceous, non-magnetic rhyolite.

Massive sections exhibit 2-5%, small (1 mm), subhedral, slightly creamy white, feldspar phenocrysts.

Locally a few thin medium green foliated to quartz-sericite schistose bands suggest rhyolite has been shear foliated along thin (10-20 cm), irregular zones at shallow, 10-40° CA. More massive sections exhibit rectangular lattice-like, fine (hairline to 2 mm) silica fracturing/veining locally up to 20% veining giving sections of unit an intense brittle fracture/pseudo brecciated appearance.

Very minor, late red carbonate lined hairline fractures.

Trace, very finely disseminated pyrite and minor, very finely

HOLE No: GB-145

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: B-145

Page 16

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
		disseminated hematite?							
		Hard, competent core.							
		Lower contact somewhat gradational into rhyolitic tuffs, oriented at 60° CA.							
269.90	293.85	QUARTZ-SERICITE SCHIST - Felsic Metavolcanic Tuff	27421	270.83	272.30	1.47	1	14	48
			27422	279.50	281.00	1.50	1	20	38
		Moderate to intensely sericitized and carbonatized?, weak to moderately silicified and weakly chloritized.	27423	287.00	288.65	1.65	1	16	42
									830
									800
									620
		Similar to 209.60-223.05 m and 230.60-245.85 m, with this unit also including several large jasper chert fragments suggesting tuffaceous origin. Unit has appearance of fine crystal to lapilli tuff pyroclastic flow that has minor included chert fragments up to 5 cm long, and lying parallel to foliation.							
		Variably creamy, buff, medium pinkish to purplish greys in patches and bands with abundant thin to thicker (1 mm to cm wide), foliation parallel lamina & bands of darker purplish grey coloured zones. The latter are generally more siliceous in sericite-silica rich unit, and locally are irregular criss-crossing in orientation.							
		Moderately well foliated, generally planar schistose foliation at 25-45° CA.							
		Unit generally moderate to intensely sericitized & carbonatized, weak-moderately silicified and locally may contain very minor chlorite; unit generally moderately soft and is non-magnetic.							
		Much of unit has fine-grained, quartzose-granular appearance, suggesting fine tuffaceous origin, and is relatively uniform/homogeneous in appearance.							
		Lower part of unit locally exhibits vague blebs/clasts of varying composition, suggesting part of unit may have been slightly coarser lapilli tuff; minor, more massive, generally purplish grey sections that look rhyolitic.							
		; porphyroblasts are evident in this unit, as was typical in quartz-sericite schists in upper part of this hole.							

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GUILBRIDGE
HOLE No.: GB-145

Page 17

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

More massive rhyolitic sections exhibit typical quartz-vein brecciation, but these appear subdued in this intensely sericitized unit. Schistose zones contain only minor quartz veining and minor late, fracturing with reddish (hematitic) carbonate.

Unit does not contain visible sulphides but contains 0.5 to locally 3-5% very finely disseminated hematite grains.

Very competent core, with 25-100 cm breakage across foliation.

Lower contact gradational.

293.85 323.20 RHYOLITE - and Fault Zone

Same as rhyolite between 262.75-269.90 m.

Patchy, buff to creamy brown or slightly darker purplish brown, aphanitic, massive, non-magnetic, rhyolite flow/intrusive. Locally has autobrecciated appearance, generally exhibits 1-3%, small (1-2 mm), subhedral, white feldspar phenocrysts with somewhat diffuse edges.

Several medium green-grey, fine-grained shear foliated rhyolite or tuff sections with quartz-sericite composition occur

at:

296.76-296.99 m	foliated at 50° CA
299.00-299.20 m	foliated at 45° CA
299.38-299.82 m	foliated at 45° CA
300.05-300.65 m	foliated at 45° CA
302.50-303.40 m	foliated at 40-50° CA
303.65-304.08 m	foliated at 45° CA.

Rhyolite is hard competent unit with brittle fractured appearance due to abundant 5-10%, small (hairline to 1 or 2 cm), irregular to subplanar as well as networking quartz veining locally giving unit a mottled pseudobrecciated appearance.

Abundant (5%) hairline to 1 mm, epidote coated late fractures. These spaced 1-5 cm apart, are generally subplanar to network fracturing and branching.

No visible sulphides.

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULIBRIDGE
HOLE No.: GB-145

Page 18

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
		Minor finely disseminated specular hematite.							
		316.25-319.00 m - Late Fault Zone - rubbly broken rhyolite with abundant (10-30%) late fracturing with hematitic orange carbonate fracture lining/filling, and several 0.5 to several metre wide fault/fracture zones; core is vuggy, with calcite probably weathered out from carbonate fractures. Fracturing oriented at various angles to core axis, forming intensely broken brecciated zone, but larger and most fractures are at 30-35° CA.							
		Entire unit is hard, but relatively broken in 5-20 cm pieces with several zones of 1-10 cm breakage, generally along fracture surfaces.							
		Lower contact, relatively sharp and planar at 50' CA.							
323.20	336.64	HEMATITIC SILICEOUS, VERY FINE-GRAINED PE-RICH CHERTY METASEDIMENT	27424	325.35	326.40	1.05	135	2	84
			27425	331.00	332.50	1.50	76	2	80

Possibly partly mafic metavolcanic flows interbanded with interflow hematitic/siliceous cherty material as in 337.52 to 349.06 m.

Very fine-grained to locally aphanitic, generally dark, slightly purplish to purplish-brown, black.

Unit appears to be an iron rich, siliceous metasediment or "very dirty chert"; unit locally contains thin (1-10 mm), irregular bands and fragments of red chert.

323.20-323.30 m - light grey felsic metavolcanic tuff
323.30-323.55 m - hematitic chert at 45° CA
323.55-325.35 m - purple to green tuffaceous sediment
325.35-336.64 m - relatively homogeneous hematitic-siliceous metasediment, possibly including some mafic metavolcanic flow rock.

Unit generally weak to moderately laminated/foliated at ~ 40-50° CA.

Generally non-magnetic though very locally some red cherty bands

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE

HOLE No.: GB-145

Page 19

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS				
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)

have some associated magnetite making them magnetic; unit has a brown-red streak due to hematite content.

Unit generally has silica-hematite:plagioclase? composition, with local zones/patches where biotite occurs in interstices between small (<1 to 3 mm) elongate, light purplish-blue silica globules (variolites?). In these zones individual globules are surrounded by fine biotite matrix, and locally coalesce into glomeratic zones where globules adjoin and then form homogeneous zones of light-purplish blue rock. These appear to be similar to sedimentary ooze formations with silica separating out in globules much like formation of chert nodules in limestone or limestone nodules in shale.

Unit exhibits 10% very irregular banded to swirled patchy epidote:silica:garnet alteration that is generally typical of mafic metavolcanic units. This alteration is very irregular locally diffusing into wallrock without distinct contact bands where it appears more like a pervasive alteration/flooding. Many of these sections could have mafic tuffaceous component or possibly be altered mafic meta-volcanic flows.

2-3% irregular, thin (1-5 mm), discontinuous veinlets and fracturing with late salmon-pink to reddish carbonate/calcite. Minor white, coarse calcite patches up to 1 cm in size locally occurs with some epidote alteration veins/patches.

Minor, hairline to a few mm, irregular veining to discontinuous tension fracture silica veinlets.

No visible sulphides.

Lower contact sharp intrusive contact.

336.64 337.52 FELDSPAR PORPHYRITIC INTERMEDIATE - MAFIC INTRUSIVE DYKE

Medium greenish-grey, very fine-grained, hard, massive, porphyritic dyke containing 10-20% small to large (<1 mm to 5 mm), lighter coloured greenish-white subhedral laths and joined feldspar phenocrysts generally exhibiting some zoning.

Dyke also contains some (5%) smaller (1-2 mm), very fine-

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 20

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS
							Cu (ppm) Pb (ppm) Zn (ppm) Ba (ppm)
		grained, subrounded, mafic (plag + epidotized + chloritized ferromagnesian - pyroxene?) mineral xenoliths? If the latter are xenoliths of a parent magma, then they are clearly now in a more siliceous dyke phase of the intrusive, which accounts for small subrounded and altered nature/character of the xenoliths.					
		Unit is massive and not foliated, moderately magnetic.					
		Minor hairline fractures with epidote coatings.					
		No visible sulphides.					
		Upper contact sharp at 50° CA and lower contact sharp & planar @ 65° CA, with contacts cross-cutting foliation.					
337.52	349.00	HEMATITE & SILICEOUS PE-RICH CHERTY METASEDIMENT ± MAFIC METAVOLCANIC FLOW/TUFF					
		Similar to 323.20-336.64 m above small intrusive dyke, but this lower part of unit contains some more massive zones that locally could be Fe-altered and silicified mafic metavolcanic flows/tuffs? with Fe-rich metasediments as interflow accumulations.					
		This lower unit also is more agnetic, than overlying part of unit containing magnetite stringers/bands in association with more silica rich zones/bands. Generally weak to moderately magnetic with strong magnetic zones occurring along magnetite bands.					
		Patchy dark greenish-grey to hematitic reddish-brown grey with 20-30% overprinting of light green epidote alteration patches/bands and veinlets.					
		Generally very fine-grained, very weakly to locally moderately banded and foliated generally at 30-40° CA.					
		Silica-hematite:plagioclase and magnetite composition locally with development of bands & zones of metasedimentary looking fine silica ovoids and globules (possibly variolites in basalt) in fine hematitic matrix as described in overlying unit 323.20-336.64 m.					
		20-30% irregular patches and bands of epidote alteration,					

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 21

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

locally containing some silica and pinkish garnet. Patches are small to large (up to 30 cm) often with diffuse boundaries into adjacent wallrock; epidote alteration also occurs as more distinct bands and veins at various angles to core axis although more commonly subparallel to foliation/bedding. (Preferential alteration of particular beds with preferred original composition or permeability.) Epidote alteration also occurs as late, small irregular fractures at various angles to CA.

2-3% irregular thin (hairline to 3 mm) silica veinlets; 1-2% coarse, white, calcite lenses/patches up to 1 cm in size often with fractures in epidote altered patches. 1-2% late, irregular, but generally subplanar fractures with thin (hairline to 2 mm) salmon pink carbonate + silica or calcite linings.

No visible sulphide mineralization.

Hard competent core with breakage generally along foliation parallel surfaces.

Lower contact sharp lithological contact at 40° CA.

349.00	385.50	METASEDIMENT/CHERTY ARGILLITE/MAPIC METAVOLCANIC	27426	365.37	366.37	1.00	1	28	70	200
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Metasediment mottled light green-grey to medium grey, fine-grained, massive to banded (30-50° CA), foliated generally parallel to banding. Note small maroon cherty fragments at 352.35 m. Non- to very weakly magnetic. Slightly coarser grained near bottom of interval - possibly tuffaceous. Cherty argillite light grey-buff to maroon, very fine-grained, thinly laminated, particularly at contacts (20-50° CA). Light grey cherts mostly silica with little other interbedded sediment, eg. 368.03-368.94 m, 369.77-370.38 (minor maroon chert). Maroon cherty argillite intervals vary from dominantly silica-rich (jasper), eg. 363.25 m (15 cm), 383.20 m (10 cm), 383.45 m (15 cm), to appreciable argillite content, eg. 382.80 m (20 cm), 382.90 m (15 cm). Maroon cherty argillite weakly-moderately magnetic, light grey chert generally non-magnetic.

Fault zone @ 359.45 m, 15 cm wide, brecciated with light green-grey angular sed fragments in a reddish cherty matrix, also some carbonate, fabric at about 30° CA.

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 22

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
		Metasediment weak pervasive chlorite, minor blotchy epidote : sericite alteration (eg. 361.30 m). Note patchy bleaching/ silicification from 349.40-352.20 m and 352.80-354.10 m. Numerous narrow carb-qtz veins and veinlets, commonly with qtz/calcite cores and reddish Fe-carb selvages. In upper part of interval, note roundish-elliptical, 1 mm globs - not unlike variolites in overlying unit - possibly alteration; also patchy chl amygdaloidal-looking blebs (eg. 354 m). Cherts commonly contain numerous qtz-chl-ep-carbatic veinlets and veins.								
		Minor py disseminations.								
		362.43 364.31 Cherty Argillite Mainly light grey-green with interbeds of maroon chert near top. Thinly laminated 25-30° CA. More tuffaceous near bottom. Upper 35 cm strongly qtz-ep altered.								
		365.18 366.59 Cherty Argillite Dominantly maroon chert, minor argillite content. Thinly laminated 35-40° CA. Few irregular qtz-act-ep veinlets.								
		370.74 380.27 Mafic Metavolcanic Mottled medium-dark grey-green, fine-grained. Sporadic foliation 30-50° CA, otherwise more a massive appearance. Weakly magnetic. Minor cherty interflow/interpillow(?) sands: 373.46 m (3 cm @ 45° CA), 374.50-374.90 m (generally chaotic, but 50° CA on upper contact). Weak pervasive chl alteration. Patchy bleached zones of carb-ep; eg. 375.12 m (30 cm). Numerous carb-qtz-Fe-carb veins and veinlets.								
		383.87 385.50 Chert Light grey-buff to brownish. Very fine-grained, laminated 50-60° CA, especially near bottom, more chaotic near top, where it grades into very siliceous metasediment/tuff. Lower contact very sharp at 55° CA. Numerous qtz-carb stringers and veinlets. Minor fine-grained disseminated & blebby py, mainly near lower contact.								
385.50	394.03	MAFIC METAVOLCANIC	27427	385.50	386.18	0.68	68	8	98	710
		Medium-dark greenish, fine-grained, commonly mottled, but likely an alteration feature. Sporadic stretched amygdulites up to 1 cm long, aligned parallel to foliation, calcite								

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 23

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
		filled. Foliation 45-50° CA - note, some tightly folded carb veins (eg. 393 m). Weakly magnetic sporadically. Lower contact sharp @ 60° CA. Moderately chl altered, also hornfelsed (fractures across foliation). Numerous white quartz-carb veins and veinlets; carbonate alteration weakly pervasive. Strong veiny patches of carb-qtz-sc alteration 387.50 m (10 cm), 390-399.30 m, 397 m (10 cm). Disseminated py 0.5-1% in upper 0.5 m, then grades to trace. Py conformable to foliation and fine-grained.								
394.03	396.12	INTERBEDDED CHERT/METASEDIMENT	27428	394.03	394.53	0.50	2	2	24	300
		Mottled bleached light grey to green to buff. All units fine-grained although more granite interval around 395.50 m, more "grainy" (strongly foliated granite). Interval = 75% light grey-buff chert with remainder light grey-green metasediment (siltstone) (eg. 395.80 m) and foliated granitic. Chert thinly laminated at 50-65° CA. Metasediment appears more massive and very soft. foliated granite mottled dark grey-pinkish and fabric = 40° CA. Lower contact of granite sharp @ 60° CA. Lower contact of interval sharp but irregular and core broken. Numerous carb-qtz:sc veins/veinlets, generally irregular. Finely disseminated py trace to 0.5%, particularly in upper 0.75 m. Also note 2 magnetite-rich bands in upper 30 cm.								
396.12	444.86	MAFIC METAVOLCANIC	27429	438.69	439.19	0.50	25	2	68	270
		Medium dark greenish, fine-grained, rare blebs which are likely amygdaloidal (calcite), eg. 404.20 m weakly magnetic. Foliation very subtle and unit generally appears massive though foliation averages = 50° CA - note how some early veins very contorted. Fine-grained granitic dykes & veinlets abundant in upper 16 m. Few chert and cherty sediment interflow/pillow, eg. 412.30 m (20 cm), 413.03 m (5 cm @ 55° CA), 433 m (15 cm @ 60° CA), 433.50 m (20 cm, mixed metasediment & chert), 434.80 m (25 cm @ 55° CA, note magnetite bands near lower contact). Core blocky, particularly in upper 16 m - likely fault zone exploited by granitic intrusion. Fault zones: 412.20 m, gouge.								

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 24

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)
		brecciated, extends over 10 cm; 426.55 m, brecciation zone over 10 cm with angled wallrock frags and calcite matrix; 437 m, 5 cm gouge, chloritic, at contact with dyke 40° CA, though chloritic and strongly fractured 40 cm above fault; 443.75-444.86 m, gouge zone at upper 5 cm then sheared (50° CA) and brecciation with clay-qtz-carb matrix.							
		Moderate pervasive chl. Numerous calcite ± qtz veins at various orientations - notably 402.75 m, 416.68 m, 420.50-421 m (note epidote). Few qtz veins, seen earlier than calcite. Zp blotches and also associated with calcite veins. Rare sporadic light grey-whitish specks possibly saussurite or leucotene(?). Very minor py disseminations.							
396.12	398.71	Foliated Granite Pinkish-orange, fine-grained, irregular though foliated 55° CA. Abundant qtz-sc-carb veins and veinlets/stringers, hematite stained.							
404.44	408.85	Foliated Granite Pinkish-orange, fine-grained, foliated at 55° CA. Hematite stained. Upper contact sharp @ 55° CA and very carbonate-rich, lower contact irregular with numerous dykelets extending below. Brecciated appearance caused by intense carb-qtz and sc flooding, particularly 1-2 m below upper contact. Also frags of mafic metavolcanic and chert.							
410.17	411.90	Chert Light-medium grey, pinkish-orange bitn may be faulted in foliated granite, but very fine grained. Blocky & broken core but laminated 55-60° CA. Note magnetite-rich layers @ 410.55 m. Upper contact sharp but irregular, averaging 80° CA, lower contact sharp at 50° CA. Numerous hairline fracture-fillings of qtz-sc and latter carb veins.							
437.04	443.75	Andesite Dyke Medium grey with patchy orange (hematitic) stain, fine-grained though grainy, weakly porphyritic especially in middle of dyke with 5-10% feldspar and possibly qtz and chl mafic phenos. Some feldspar phenos are rimmed with hematite stain (eg. 438 m). Few feldspar bathes glomerate. Groundmass consists of chl, fp and appreciable qtz. Blocky core at 441 m. Good chill margins at upper contact (40-50 cm) and lower contact (35 cm). Upper and lower contact abrupt and bounded by faults.							

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULIBRIDGE
HOLE No.: GB-145

Page 25

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
444.86	453.35	PELSIC METAVOLCANIC - LITHIC TUFF	27430	445.35	445.85	0.50	1	20	12	820

Few veins & fracture fillings of qtz-carb and ep. Patchy orange colour likely hematite alteration, though weak, also no hematite near ep veinlets. Very minor disseminated py.

Light grey-green to light grey, fine-grained, foliated at 35-60° CA. Possibly finer down-interval. $\pm$ 5% white, very fine-grained, subround-angled chert frags range from coarse ash to lapilli size, e.g. 445.50-446 m. Possibly qtz $\pm$ sp crystal frags though difficult to tell. Very siliceous, likely of rhyolitic composition, possibly also cherty. Few narrow, laminated, very fine-grained (ash?) horizons: 447.68-448.31 m (40-80° CA), 449.40 m (16 cm @ 45° CA), 451.88 m (2 cm @ 55° CA), 452.82 m (3 cm @ 50° CA). Possibly 5 cm wide zone of whitish < 1 mm diameter spherulites @ 452.12 m - could be a large spherulitic frag (note also 449.40 m). Lower contact sharp @ 55° CA.

Moderate ac alteration. Few irregular qtz-carb veins, some with pinkish envelopes (potassic). Patchy weak chl(?) alteration diffuse around some veins.

Trace disseminated py.

453.35 475.49 MAFIC METAVOLCANIC - TUFFACEOUS

Mottled medium-dark green to brownish, fine-grained, though grainy, foliated 55-60° CA. Upper 3.5 m appears possibly amygdaloidal, 10% elongated, carb-ep filled, generally parallel to foliation. Brownish tinge likely due to appreciable amounts of biotite. Grainy nature gives tuffaceous character. Gougey fault zone 2-3 cm wide at 50° CA @ 458.90 m. Non-magnetic. Lower contact sharp @ 65° CA.

Moderate pervasive chl and patchy biotite. Few carb-qtz:ep veins. Appears the more ep-rich, the older the vein (parallel foliation) whereas clean carb veins/veinlets irregular, commonly cut foliation. Notable veins at: 464.05 m (irregular minor jasper), 465.35 m (brecciated over 3 cm with jasper-carb), 466.25 m (irregular over 15 cm), 468.35 m (irregular over 10 cm).

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 26

FROM TO		LITHOLOGICAL DESCRIPTION	ASSAYS							
			SAMPLE No.	FROM	TO	WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
		contorted, ep-rich).								
		Disseminated and blebby py ± 0.5%.								
459.15	461.43	Cherty Felsic Metavolcanic Banded light grey-green, very fine-grained though lower 50 cm fine-grained and grainy. Banding averages 65° CA, bands range from < 1 mm to 1 cm, note lower part closer to 40° CA. Banding is compositional and likely parallel to foliation along planes with sc & chl. Very siliceous & rhyolitic in composition - similar to unit between 444.86-453.35 m, though this unit more ashy - no obvious lithic fragments. More cherty near top. Narrow brownish, fine-grained, soft, silty horizons: 459.68 m (3 cm @ 60° CA), 459.83 m (2 cm @ 65° CA). Upper contact sharp at 55° CA, lower contact sharp @ 60° CA. Weak-moderate scchl alteration (metamorphism). Few qtz-carb veinlets, rarely with pinkish feldspar. Trace very finely disseminated sulphide, mainly in lower 50 cm, and fracture fillings at upper contact.								
470.98	474.39	Andesite Dyke Medium-dark green, fine-grained, weakly parallel with < 5% whitish feldspar phenocrysts mainly concentrated in middle of dyke. Weakly-moderately magnetic. Upper and lower contacts sharp but very subtle @ 70° CA (irregular) and 25°, respectively. Fairly well developed chill margins at each contact. Few irregular oriented carbteq stringers. Very minor finely disseminated sulphides.								
475.49	480.61	PELSIC METAVOLCANIC - LITHIC TUFF/WACKE Mottled medium grey-brown, generally fine-grained, well foliated @ 45-55° CA. Note, rock hornfelsed as breaks across foliation. Up to 10% coarse ash to lapilli size frags, particularly 478.25-479.30 m. Frags parallel foliation, light grey-green chert or rhyolite and possibly flattened(?). Also possibly qtz & feldspar crystal frags,, though difficult to distinguish from small lithic frags. Some qtz may have a bluish tinge. Fine siliceous ash (likely rhyolitic) with appreciable bi & chl - could be a lithic wacke (immature clastic). Light grey cherty layer (8 cm), conformable to foliation @ 479.40 m. Lower 60 cm very greenish (chl altered), almost looks like mafic	27431	477.24	477.74	0.50	3	2	34	520

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE

HOLE No.: GB-145

Page 27

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu (ppm)	Pb (ppm)	Zn (ppm)	Ba (ppm)
		metavolcanic, likely altered effect from dykes. Lower contact sharp at ~ 78° CA, but irregular.								
		Minor carb-qtz veins/veinlets, mainly cutting foliation - exception to this at 476.60 m where 15 cm wide qtz-carb zone parallel to foliation.								
		Py cubes, blebs & minor fracture fillings disseminated 0.5%.								
480.61	529.15	PORPHYRITIC ANDESITE DYKE	27432	520.74	521.24	0.50	11	2	68	210
		Light-medium grey, fine-grained, massive, porphyritic with 5-10% whitish (commonly hematitic) feldspar laths (feldspar likely plag. - note zoning in some of larger phenos (eg. 501.45 m) up to 1 cm long but more commonly 1-2 cm; feldspar phenos commonly glomeroporphyritic; few & dark green chl mafic phenos (hornblende) rarely up to 1 cm long, usually 1-2 mm (eg. ~ 514.70 m). Groundmass fairly hard, mostly chl & qtz. Non- to weakly magnetic. Brecciated fault zone 10 cm wide with angles and frags in orangish (hematitic?) and carb matrix at 493.65 m (25° CA). Contacts generally sharp, very narrow chill margin with accompanying decrease in phenos.								
		Few irregular carb-qtz:sc (or ep) veins/veinlets and stringers, rarely accompanied by narrow zones of bleaching & brecciation: 506 m, 509.65 m. Few ep veins with weak bleaching envelopes extending a few cm.								
		Finely disseminated sulphide (<0.5%).								
		495.81 497.93 Mafic and felsic Metavolcanic Xenolithic Light grey (felsic metavolcanic) to dark green (mafic metavolcanic). Felsic metavolcanic in upper 25 cm and lower 90 cm of xeno-massive to finely laminated @ 40° CA. Minor py conformable to laminations. Mafic metavolcanic fine-grained foliated @ 40° CA, may be tuffaceous similar to 453.35-475.49 m.								
529.15	563.06	METASEDIMENT/MAFIC METAVOLCANIC	27433	540.66	541.16	0.50	1	8	176	70
		Mottled and banded medium-dark grey-green, very fine-grained to fine-grained. To about 547 m, fairly regularly banded from mm to 5 cm wide. Banding subtle & illustrated by colour and grain								

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 28

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

size - probably an interbedded mud and silt sequence; @ 30-40° CA. Likely also tightly folded - note 534.77 m and 532.13 m. Possibly sourced by mafic volcanics. May also be a well foliated pillow basalt. Moderately to strongly magnetic. Few narrow light grey, very fine-grained cherty(?) interbeds, parallel to banding: 530.33 m, 533.10 m, 534.35 m, 535.50 m, 537.05 m. Below 547 m, loose banding (although still foliated 40-55° CA), and becomes more chaotic mafic metavolcanic - could be a pillow basalt/brecciation. Distinct fragmental appearance, with some frags containing feldspar phenos. Weakly magnetic, although becomes moderate near end of interval. 70 cm andesite dyke @ 560.06 m, porphyritic, sharp, irregular contacts. Lower contact sharp @ 35° CA, note brecciation over ~ 1-2 cm. Also very subtle @ 559 m (50-60 cm).

Moderately chl altered, but likely regional metamorphic effect. Few carb-qtz veins/veinlets and minor yellow green stringers of sc (ep?). Above 547 m most veins parallel to banding/foliation. Below 547 m increase in veining (10%) as well as increase in light greenish ep patches, veins, stringers. Rarely pink feldspar selvages on some qtz veins.

Minor to locally 0.5% finely disseminated py.

563.46 594.07 PORPHYRITIC ANDESITE DYKE

Medium grey to buff-brownish, fine-grained, non- to porphyritic with up to 10% feldspar laths 1 cm long (particularly in upper few m's). Phenocryst size generally decreases from 569 m. Feldspar phenocrysts commonly pinkish colour. Fine to very fine-grained groundmass, hard, chloritic and somewhat siliceous. Irregular buff-brown zones likely caused by major fault zone - note patches of very rubbly core. Non- to weakly magnetic - note buff-brown part of andesite weakly magnetic. Dark green, fine-grained, generally non-porphyritic, foliated(?) intervals between 575.15-592.50 m possibly mafic metavolcanic, though difficult to tell - note 15 cm wide foliated (55° CA) chloritic interval @ 592.43 m. Lower contact abrupt @ 60° CA.

Buff-brown zones possibly weakly hematite altered, grey zones weak chl alteration. Numerous irregular veins/veinlets/stringers of carb-qtz:ep as well as ep alone. More milky pink-orange Fe-carb veins or selvages. Ep also occurs in

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 29

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu (ppm)	Pb (ppm)	Zn (ppm)

irregular patches (579 m). In darker green mafic metavolcanic zones, carb-qtzite veins appear to exploit pre-existing foliation (eg. 589.50 m, 589.90-591.50 m).

Minor finely disseminated sulphide.

569.47 591.00 Fault Zone
Zone of very broken rubble core, especially: 569.47-576 m, 574.75 m, 577 m, 580.55-581.50 m, 582 m, 589 m. Breccia zone (possibly rebrecciated breccia) from 586.59-588.18 m, mottled light-dark grey-green, frag-supported, round to angled frags of mafic & possibly sediment(?), matrix soft clay-chl.

594.07 601.22 METASEDIMENT/MAFIC METAVOLCANIC

Medium grey to dark green, fine-grained to grainy. Metasediment ranges from dark greenish (more mafic source, similar to interval between 592.15-563.06 m) to medium grey (siliceous, eg. 595.60-597.33 m). Mafic metavolcanic dark green (eg. 597.32-599.53 m). Metasediment: dark green variety (argillite/siltstone) from 594.07-595.25 m, 599.53-601.22 m, banding/foliation illustrated by colour variation and grain size (grainy layers) @ 45-50° CA, bands mm to few cm wide, few 1-10 cm light grey cherty layers, fine-grained darker green metasediment moderate-strongly magnetic; medium grey variety (tuffaceous wacke) from 595.25-597.32 m, bedded/foliated @ 40° CA, beds from a few mm's to a few cm's, few light grey siliceous (cherty) sections near top of interval, locally magnetic bands (596.75 m), 50 cm section @ 596.25 m fine-grained to medium-grained with lithic-rich section over 15 cm, lithic frags < 1 mm to 3 cm long, aligned parallel to fabric, light grey, very fine-grained and siliceous (chert) - interval could be tuffaceous.
Mafic metavolcanic: 597.32-599.53 m, massive but possibly a subtle foliation (e.g. 597.77 m @ 35-40° CA), sporadic non- to moderately magnetic.

Weakly chl (metamorphic) hornfelsic. Numerous carb-qtzite veins/stringers, generally irregular but also parallel fabric. Few veins brecciation.

Very minor disseminated sulphide, confined to foliation.

DIAMOND DRILL LOG

PROPERTY: GULLBRIDGE
HOLE No.: GB-145

Page 30

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS
						WIDTH Cu (ppm) Pb (ppm) Zn (ppm) Ba (ppm)

601.22 208

SUMMARY:

Hole 145 was drilled to test the bimodal sequence stratigraphy approximately 2 km north of the mine. The hole consists of ferruginous/argillaceous/tuffaceous cherts (to 44.85 m), massive to foliated felsic metavolcanic flows/tuffs (to 209.60 m), rhyolitic quartz sericite schists, cherty interbeds and rhyolite flows (to 323.20 m), metasediments, ferruginous/argillaceous cherts, mafic metavolcanic (to 385.50 m), mafic metavolcanic, chert/metasediment, felsic metavolcanic (to 601.22 m). Numerous diabasic and porphyritic andesite dykes intruded the stratigraphy, especially near the bottom of the hole. Numerous rubbly fault zones were also encountered.

The bimodal sequence is represented by lithologies between 323.20-385.00 m but possibly extends from 209.60 m to below 385.50 m, where mafic metavolcanics become dominant. Alteration/metamorphism is generally weak and no significant sulphides were encountered.

DOWN-HOLE SURVEY DATA

DEPTH	INCLINATION	BEARING
37.19	-63.00	80.00
113.08	-60.00	80.00
207.87	-59.00	85.00
326.75	-56.00	87.00
430.38	-54.00	90.00
524.87	-53.00	98.00
601.07	-53.00	98.00

PROJECT: ROBERT'S ARM - GULL BRIDGE

SAMPLE NUMBER	SAMPLE INTERVAL			Cu ppm	Pb ppm	Zn ppm	Ba ppm	SULPHIDES	DESCRIPTION
	FROM	TO	LENGTH						
27404	27.50	31.00	1.50	41	28	24	220	minor py	well laminated, reddish ferruginous chert
27405	31.00	32.50	1.50	93	40	22	230	minor py	as above
27406	42.35	43.85	1.50	4	34	38	690	minor py	as above
27407	51.00	52.80	1.80	41	14	26	670	minor py	sericitized/silicified porphyroblastic felsic metavolcanic; fragmental
27408	52.80	52.95	0.15	4	36	34	390	tr py	as above but pinkish-red altered silica veining, l ^{ox}
27409	56.70	58.00	1.30	41	20	32	690	tr py minor dissem. spec. hem.	variably mottled coloured silicification & sericitized; porph. felsic volcanic
27410	107.00	108.00	1.00	41	14	30	1000	tr py minor dissem. spec. hem.	porphyroblastic; sil. = ser; felsic metavolcanic
27411	108.00	109.00	1.00	41	12	28	1170	as above	as above
27412	121.00	122.00	1.00	41	16	28	710	minor py	typical porphyroblastic (20%) sil., ser., felsic volcanic
27413	168.00	170.00	2.00	41	4	28	910	none visible	intensely silica flooded (veins); f. g. rhyolitic flow? / tuff
27414	192.80	195.00	2.20	41	12	36	780	none visible	qtz-ser schist (rhyolitic flow?)
27415	229.00	230.60	1.60	10	18	16	630	tr-minor spec. hem. none visible	brecciated (qtz veined) rhyolite
27416	243.00	245.00	2.00	32	16	30	900	none visible	felsic metavolcanic welded ash tuff
27417	253.00	254.00	1.00	41	80	66	750	none visible	red ferruginous chert / argillaceous chert
27418	258.00	258.65	0.65	41	38	56	660	none visible	as above
27419	260.10	261.50	1.40	53	8	64	250	none visible	intensely silicified, epidote altered mafic metavolcanic, mt
27420	261.50	262.75	1.25	76	10	70	200	none visible	as above
27421	270.83	272.30	1.47	41	14	40	830	3-5% spec. hem.	intensely sericitized & carbonatized, wkly silic. felsic tuff

PAGE NO. 2/2

HOLE NO. GB-145

PROJECT: ROBERT'S ARM - GULL BRIDGE

[illegible]

