RDN: A SHALLOW MARINE VMS PROSPECT

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INTRODUCTION

The RDN property, owned 100% by Rimfire Minerals Corporation, is a shallow marine volcanogenic massive sulphide (VMS) prospect with striking similarities to Barrick Gold Corporation's high-grade Eskay Creek deposit 40 kilometres to the south. The RDN property covers 68 square kilometres of mountainous terrain, approximately 120 kilometres northwest of Stewart, British Columbia. Access to the property is by helicopter from Bob Quinn airstrip, which lies on the Stewart-Cassiar highway 20 kilometres to the east. The Eskay Creek access road passes fifteen kilometres southeast of the RDN property.

Eskay Creek, with production plus reserves of 3.9 million ounces Au and 175 million ounces Ag (Rogers, 2002), is considered to be the product of a low-sulphidation epithermal system venting to the sea-floor in a shallow marine setting. As such, it combines some of the features of Kuroko-style VMS deposits with those of low-sulphidation epithermal precious metal deposits. The RDN property shares a number of geological and geochemical characteristics with Eskay Creek, that form the basis for the RDN exploration model.

EXPLORATION HISTORY

Prior to 1987, no work had been recorded on the area covered by the current RDN property. Extensive exploration, including 3,633 metres of diamond drilling in 30

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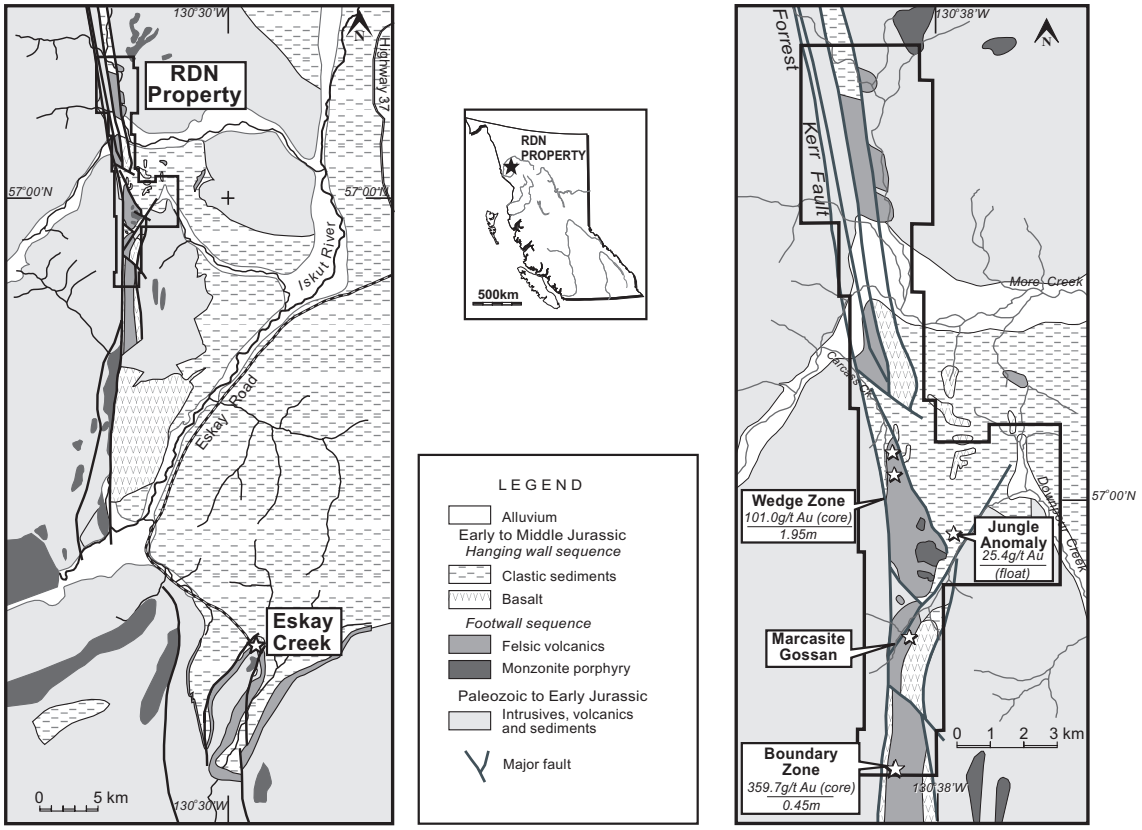

Figure 1. RDN regional and property geology (regional geology adapted from Logan *et al.*, 2000 and Alldrick *et al.*, 1989).

holes, was carried out on it from 1988 to 1992 by Noranda and others, directed almost entirely at Au-bearing quartz-sulphide veins. At that time, quartz-sulphide veins were being developed into the Snip and Skyline mines, 40 kilometres to the southwest, and there was considerable exploration for vein mineralization throughout the Iskut River district. The Eskay Creek deposit, 40 kilometres south of the RDN property, was discovered in 1988, but its VMS nature was not widely recognized until 1990. Despite recognition that the strata that host Eskay Creek continue north and underlie the RDN property, the potential for Eskay Creek-style mineralization was barely investigated during this flurry of exploration.

Pathfinder Resources Ltd. carried out three small exploration programs on the RDN property from 1994 to 1996 and confirmed the basic features of the Eskay Creek analogy. Rimfire Minerals Corporation continued to focus on this model with extensive fieldwork from 1997 through 1999, culminating in a 9 hole, 574 metre drill program.

Newmont Exploration of Canada Limited optioned the RDN property in early 2000 and carried out a ground UTEM survey over 6.7 kilometres of "Eskay-equivalent" stratigraphy. In 2001, Newmont drilled 13 holes totalling 2,222 metres to test UTEM conductors in the vicinity of the "Eskay-equivalent" stratigraphic contact.

GEOLOGY

The RDN property extends for more than 20 kilometres along the east side of the Forrest Kerr Fault, a northerly-trending, steeply-dipping normal fault of regional extent. Paleozoic metasediments, metavolcanic rocks and plutons lie west of the Forrest Kerr Fault. East of the fault Mesozoic rocks of the Upper Triassic Stuhini Group and Lower to Middle Jurassic Hazelton Group predominate. The Stuhini Group and the base of the Hazelton Group consist mainly of andesitic to basaltic volcanic rocks and clastic sediments.

The upper part of the Hazelton Group correlates with Eskay Creek deposit strata. It consists of felsic volcanic rocks, basalt and clastic sediments. On the RDN property, the Hazelton Group felsic volcanic rocks can be split into two packages. The first package consists of rhyolitic flows and tuffs which are widespread north and west of More Creek; these are generally unmineralized and will not be discussed further. The other felsic rocks are associated with a separate felsic centre south of More Creek that extends for 13 kilometres south to the southern property boundary. This package consists dominantly of dacite and trachyte tuffs and flows, with very minor amounts of rhyodacite and rhyolite. Feldspar porphyries, locally K-spar megacrystic, form both extrusive and intrusive phases in this felsic package. The felsic rocks are generally carbonate-altered; locally they are flooded by sericite, silica and/or potassium feldspar alteration. The main feldspar porphyry intrusive body is pervasively altered to sericite, clay, pyrite and local alunite. It forms a very prominent gossan with a large associated ferricrete deposit. Lithogeochemistry shows this second package of felsic volcanic rocks to be similar to the Footwall Volcanic Unit at Eskay Creek and the K-spar megacrystic feldspar porphyry to the Eskay Porphyry (Eskay Creek nomenclature from Roth *et al.*, 1999); consequently, this package is referred to here as the "footwall" felsic sequence.

Tholeiitic basalt flows and lesser volcaniclastic rocks overlie the felsic volcanic rocks south of More Creek. Pillows are prominent, particularly in the vicinity of the Marcasite Gossan and south to the southern property boundary, indicating submarine deposition. The basalt is essentially unaltered, and chemically and texturally similar to the hanging wall basalts at Eskay Creek.

Clastic sediments, mainly argillites and siltstones, are interbedded with the basalts and become dominant up section. Together, the basalt and clastic sediments are referred to here as the "hanging wall" sequence. The argillites near the base of the hanging wall sequence are commonly carbonaceous and locally graphitic; pyrite is preserved as laminae and within pyritic clasts. Based primarily on lithogeochemical and textural similarities in the basalt at Eskay Creek and RDN, the contact between the felsic and basalt/sediment sequences is considered correlative to that which hosts Eskay Creek's 21 Zone stratiform orebodies, and is referred to here as the "Eskay-equivalent contact".

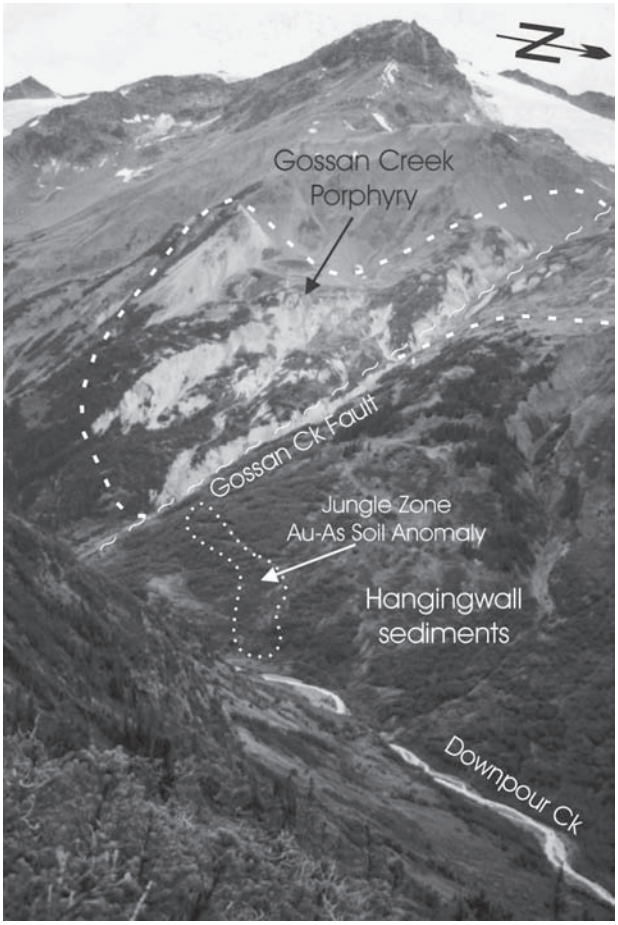

Photo 1. Looking southwest at altered and pyritized feldspar porphyry, forming prominent gossan, intruding comagmatic dacitic volcanic rocks in Downpour Creek.

The RDN property is structurally complex. The Hazelton Group is dominated by northerly trending, locally overturned, anticline-syncline pairs with steep axial surfaces. The main fault trends are northerly (parallel to the Forrest Kerr Fault), northwesterly and northeasterly. These are high angle faults, chopping the RDN property into a mosaic of fault blocks.

ESKAY CREEK-STYLE VMS PROSPECTS

Most pre-1994 work on the RDN property focused on Au-rich quartz-sulphide veins in the altered footwall felsic volcanic rocks. This veining and alteration are thought to be integral parts of a VMS hydrothermal system, both at Eskay Creek and RDN. The submarine hydrothermal systems produced base and precious metal-rich fluids which altered the footwall felsics and deposited sulphide-bearing quartz veins, stockworks and silicified zones in structural traps. Where these fluids vented to the sea floor, they became available for deposition as stratiform sulphide layers.

The "Eskay-equivalent" contact between variably altered and mineralized footwall felsic volcanic rocks and unaltered "hanging wall" clastics and mafic volcanic rocks can be traced for 9 kilometres north from the southern boundary of the RDN property. Because of its recessive nature, this contact is rarely exposed on surface and has only been penetrated in 7 drill sections: one at the Boundary Zone, one at the Marcasite Gossan, and five in the Wedge Zone. The following table summarizes significant drill intersections from the 52 drill holes. With the exception of hole RDN99-01, all intersections are within the footwall felsics.

WEDGE ZONE

Wedge Zone veining is within an 800 x 2,600 metre Au-Ag-As-Pb-Sb-Zn soil geochemical anomaly that overlies altered dacitic volcanic rocks on the eastern side of the Carcass valley. Noranda discovered a number of discontinuous quartz-sulphide breccia veins in the Wedge Zone and directed most of their drilling at them. These veins are generally hosted by barren sericite alteration, pinch and swell dramatically, and are offset by extensive small-scale cross-faults. Locally they carry very high grades, such as intersections of 1.95 metres of 101 g/tonne Au and 0.85 metres of 138 g/tonne Au in hole RG91-21. Generally, these veins are located 50 to 200 metres stratigraphically below the top of the felsic volcanic rocks.

A few of Noranda's westernmost holes were collared in, or bottomed in, hanging wall argillite. This suggested that the "Eskay-equivalent" contact runs northerly down the Carcass valley. Newmont drilled 10 of their 13 holes in this Wedge Zone contact area, however, by targeting UTEM conductors rather than stratigraphy, half of these holes were drilled entirely in either footwall dacite or hanging wall clastics.

From the 2001 Newmont drilling it is clear that the Wedge Zone stratigraphy is overturned; it dips steeply to the east but tops are to the west, and is located on the west limb of a north-south trending anticline cored by footwall dacites. The stratigraphy corresponds to a shallow marine setting, with bivalves and belemnites in the hanging wall clastics and local maroon volcaniclastic units. There are two distinct volcanic cycles at the stratigraphic top of the footwall dacite sequence. The best VMS potential is considered to be at the top of each cycle in carbonaceous and tuffaceous strata. Cycle 1 consists of a sulphide-bearing and veined subvolcanic porphyry within an emergent dome and may represent a volcanic/hydrothermal source to the

TABLE 1
SIGNIFICANT RDN DRILL INTERSECTIONS

Drill Hole	Zone	From (m)	To (m)	Length (m)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
RG90-6	Wedge	18.60	19.30	0.70	11.30	9.3	0.24	0.14	1.72
RG90-7	Wedge	56.70	61.10	4.40	11.66	16.4	0.57	0.65	1.70
		64.30	64.55	0.25	38.50	42.3	1.99	0.39	1.44
RG90-11	Wedge	26.05	26.45	0.40	18.19	8.4	0.61	0.01	0.01
		51.00	51.40	0.40	11.57	9.7	1.43	0.00	0.01
RG90-15	Wedge	26.10	26.40	0.30	17.89	10.6	0.48	0.05	0.29
RG91-16	Boundary	55.50	55.95	0.45	359.70	N/A	0.22	N/A	N/A
		56.20	56.70	0.50	3.77	13.4	2.31	0.04	0.67
RG91-20	Wedge	142.20	143.00	0.80	4.42	3.1	0.20	0.02	3.26
RG91-21	Wedge	140.75	141.60	0.85	137.80	22.3	0.87	0.10	0.31
		158.80	160.75	1.95	101.00	62.4	2.70	0.48	1.88
RG91-22	Wedge	86.50	88.50	2.00	8.22	20.7	0.45	0.75	2.29
RDN99-01	Jungle	38.00	39.10	1.10	5.19	2.0	0.01	0.05	0.09
RDN01-17	Wedge	71.50	72.00	0.50	4.17	6.4	0.31	0.09	5.67
		111.00	112.50	1.50	3.75	9.0	0.52	0.07	0.18
RDN01-20	Wedge	90.30	91.30	1.00	3.88	6.8	0.15	1.62	5.56
		125.20	125.50	0.30	7.06	10.4	0.30	0.03	4.62

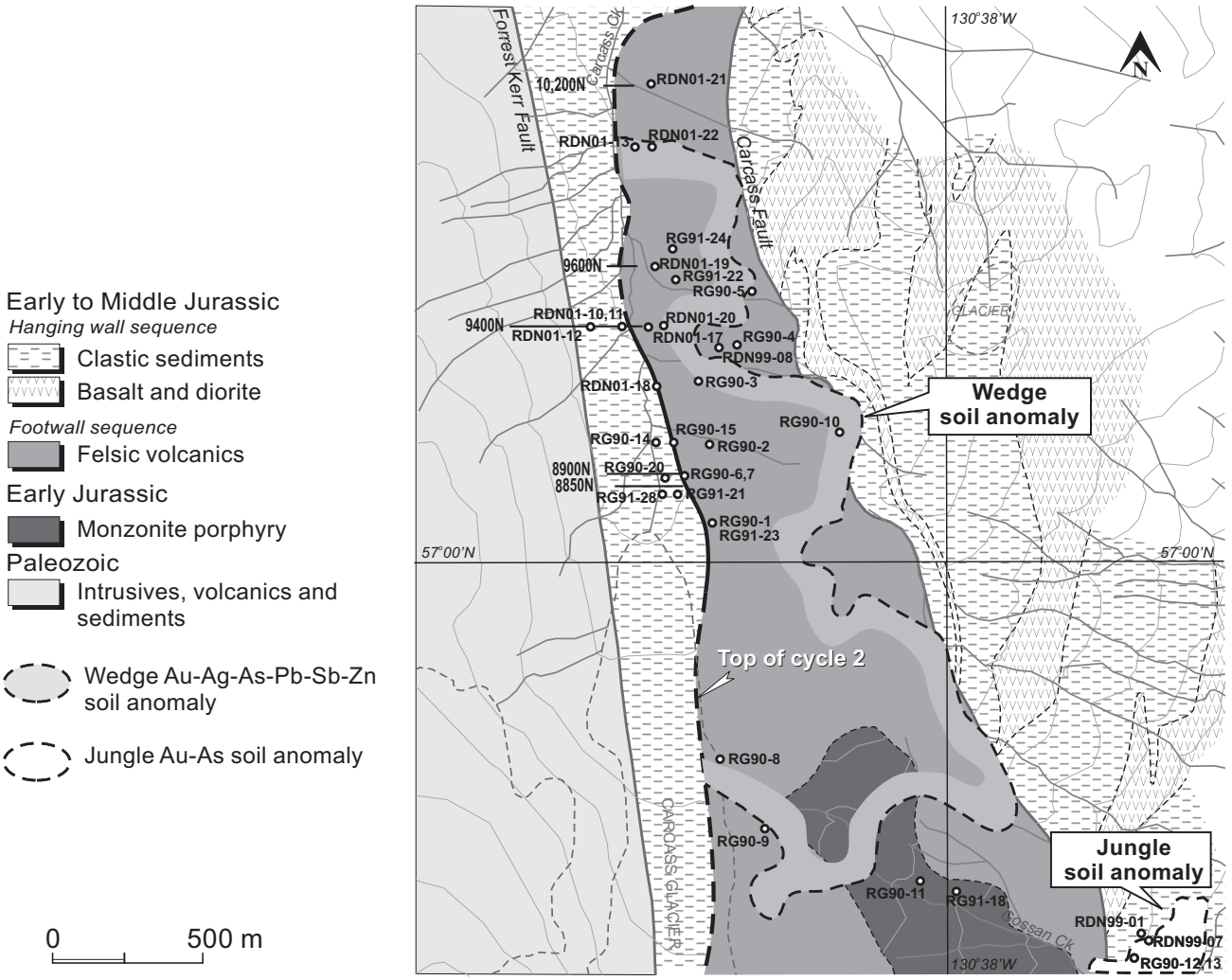

Figure 2. Wedge Zone geology, soil geochemical anomaly, and drill holes.

mineralizing system (only one hole intersected the top of Cycle 1). Widespread alteration and mineralization were developed synchronously with deposition of Cycle 2 and do not extend above the top of Cycle 2. The carbonaceous unit at the top of Cycle 2 is a preferential locus for faults, but the volcanic-sedimentary depositional contact appears to be preserved in some of the holes. Alteration and mineralization in the upper part of the footwall dacites is quite different from that related to deeper footwall veining drilled by Noranda. In the shallower setting, sulphide mineralization (including sphalerite, galena, tetrahedrite and orpiment) is more pervasive and diffuse throughout broad alteration zones, rather than in discrete, well-defined quartz-sulphide veins. A siliceous breccia, with a massive chalcopyrite clast, at the top of Cycle 2 (RDN01-17, 111.0-112.5m, 3.8 g/tonne Au) could represent a volcaniclastic breccia partially derived from stratiform sulphides.

The Wedge Zone represents a footwall alteration zone that is more than 2.5 kilometres long in a shallow marine setting. Newmont's 2001 drill campaigns targeted the top of Cycle 2 and intersected it on 3 sections in the Carcass valley. Noranda also intersected this contact further south, so it has been cut on a total of 5 sections (8850N, 8900N, 9400N, 9600N and 10200N). This leaves gaps from south to north of 50, 500, 200 and 600 metres of untested potential. Only section 9400N has been drilled sufficiently to obtain a reasonable picture of the stratigraphy and structure. Evidence of increasing metal values (including Cu) and increases in unit thickness toward possible growth faults favour drilling into the 500 metre gap south of section 9400N. More than 2 km of the "Eskay-equivalent" contact at the top of Cycle 2 remains undrilled south from section 8850N to Coal Creek, and most of this area is within the Wedge Zone soil anomaly.

JUNGLE ANOMALY

The Jungle Anomaly is a pronounced 100 x 450 metre Au+As±Ag±Pb soil geochemical anomaly in an area with little outcrop. Within the anomaly area, a cobble of pyritic, silicified argillite that is cut by quartz veinlets assayed 25.4

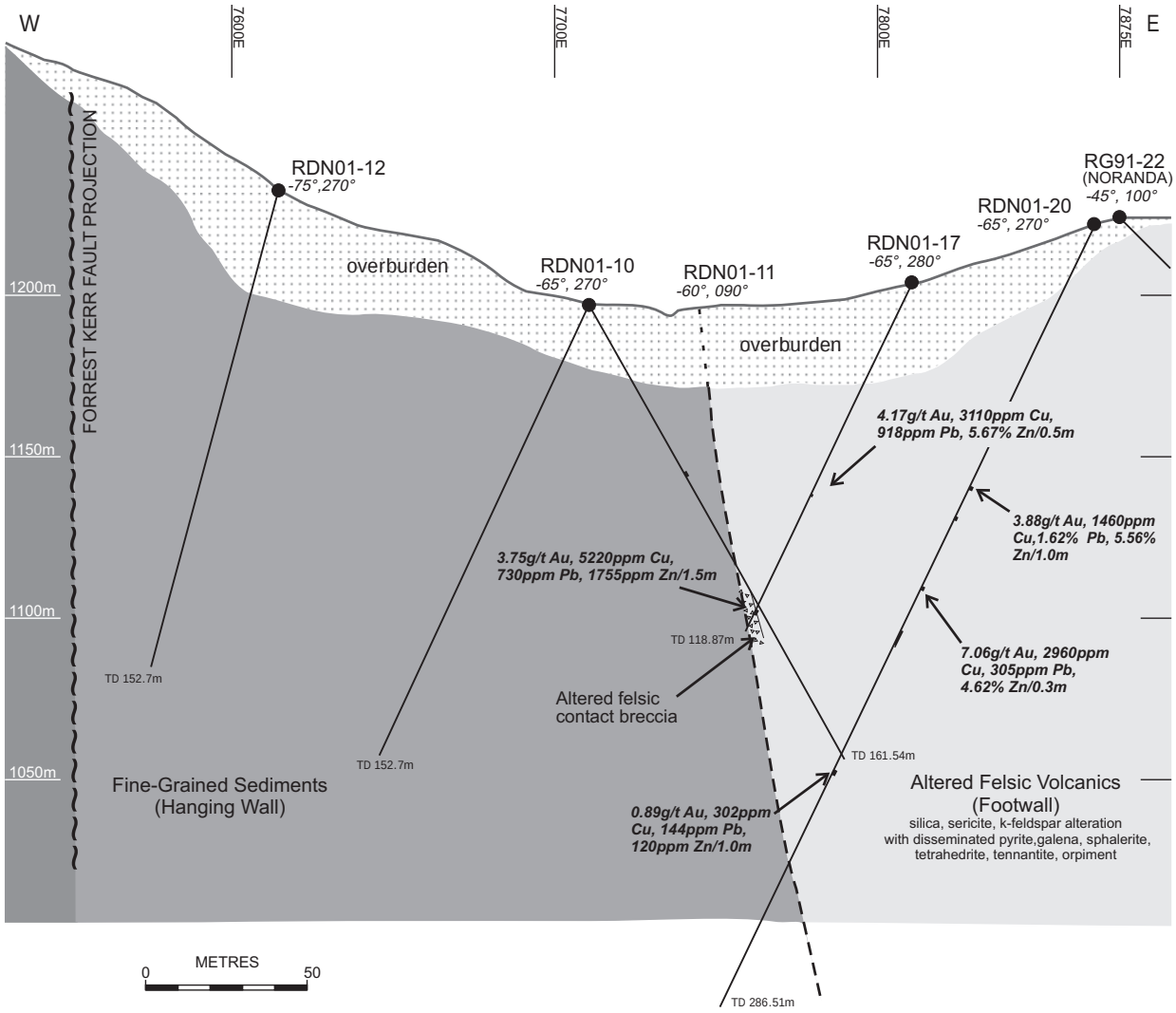

Figure 3. Wedge Zone section 9400N, looking north.

g/tonne Au with elevated As, Hg, Pb and Zn. A cluster of pyritic, slightly carbonaceous chert boulders, that could represent a silica-pyrite exhalite, were found nearby. The Jungle Anomaly is underlain by the hanging wall clastic/mafic volcanic sequence. It is stratigraphically down-section from the only exposures in the area and the contact with underlying felsic volcanic rocks might be relatively shallow.

Two holes were drilled into the Jungle Anomaly in 1999 to test the hypothesis that it represented "leakage" from an Eskay Creek-style VMS system into the overlying clastic/mafic hanging wall sequence. Due to ground conditions, both holes had to be abandoned before reaching their target depth. The holes intersected weakly elevated levels of Au and As, including 5.19 g/tonne Au across 1.1 metre, but concentrations were not high enough to explain the soil anomaly. Except for the Wedge zone area, the hanging wall sequence in this area contrasts sharply with that elsewhere on the property. Elsewhere the hanging wall sequence is devoid of both veining and anomalous metals. Although the Jungle Anomaly could simply reflect epigenetic mineralization, its potential for stratiform sulphides remains untested.

MARCASITE GOSSAN

The Marcasite Gossan, located just to the east of Downpour Creek, consists of two stacked footwall dacite flow-domes that have been altered and are cut by stockwork mineralization. Peperitic contacts indicate emplacement at or near the sea floor. Late magmatic to hydrothermal alteration of the dacite, vein stockworks and preservation of clastic pyrite-marcasite are evidence of venting of hydrothermal fluids to the sea floor. Epithermal affinities are shown by: the presence of chalcedony, pyrobitumen and marcasite; by colloform vein textures; by elevated As, Sb and Hg levels; and by the irregular, anastomosing, morphology of the vein stockworks.

Holes RDN99-05 and -06 cut a complete section across the Marcasite Gossan, from the hanging wall pillow

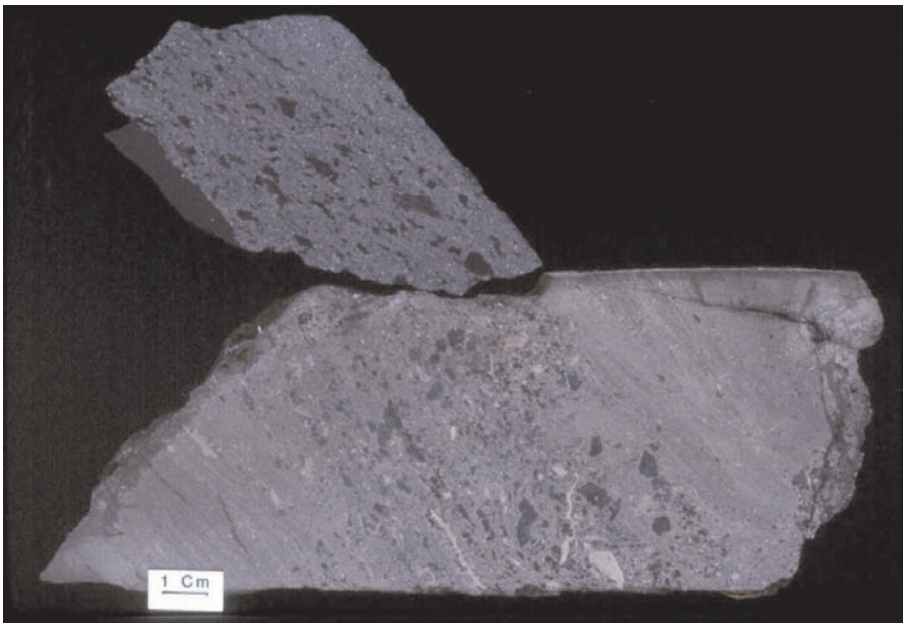

Photo 2. Clastic massive pyrite-marcasite float from Marcasite Gossan (bottom). For textural comparison, clastic massive sulphide-sulphosalt ore from 21B Zone at Eskay Creek (top).

basalts to the footwall Lower Marcasite Gossan flow-dome. The drill core shows that contacts are depositional rather than tectonic, and stratigraphy is upright with moderate east dips. The property geology indicates that the holes cut the east limb of an anticline whose western limb was truncated by faulting along Downpour Creek. A 70-metre thick basin of variably graphitic and pyritic mudstone, siltstone and wacke lies between the footwall Upper Marcasite Gossan flow-dome and the base of the hanging wall pillow basalts. Eskay Creek's "Contact Mudstone", which hosts the 21 Zone orebodies, is in a similar stratigraphic position. An altered felsite sill within the clastics above the Upper Marcasite Gossan is chemically identical to the low-titanium Eskay Rhyolite and occupies a similar stratigraphic position.

Despite elevated As, Sb and Hg levels, precious metal values to date at the Marcasite Gossan are very low. Holes RDN99-05 and -06 were drilled through the apex of the footwall dacite domes and did not encounter any stratiform massive sulphides. Better potential for accumulation of massive sulphides might be found along the flanks of the dome.

BOUNDARY ZONE

The Boundary Zone, located immediately north of the RDN property's southern boundary, consists of a group of narrow, discontinuous chalcopyrite-pyrite-quartz-calcite veins. These are hosted by maroon felsic volcanic rocks and have chlorite-hematite alteration envelopes. Some veins are planar, with local cockade textures but others contain blebby aggregations of sulphides. Veins average just a few centimetres in width and their wallrocks are not auriferous. Gold values can be extremely high; hole RG91-16 intersected 45 centimetres grading 360 g/tonne Au.

The "Eskay-equivalent" felsic/basalt contact is projected to lie <100 metres stratigraphically above the Boundary Zone veining, but is not exposed and has not been drilled. The possibility that the Boundary Zone veining represents a footwall stockwork to Eskay Creek-style Au-rich stratiform sulphides is suggested by its position near the top of the felsic volcanic sequence, chloritic alteration, high sulphide abundance relative to quartz content of veins, and high Au and Cu concentrations.

Hole RDN01-16 was drilled 130 metres north of the RDN's southern boundary, into a series of debris flows near two faults that are interpreted to be synvolcanic. Although this may represent part of the "Eskay-equivalent" contact, it sheds little information on its potential in the Boundary Zone area because veining and alteration are entirely southeast of the synvolcanic faults.

DISCUSSION AND CONCLUSIONS

The Eskay Creek VMS deposit contains 3.9 million ounces Au and 175 million ounces Ag. Given its exceptionally high Au and Ag grades and low production cost, it forms a very attractive exploration target. The key to finding a similar deposit is to locate shallow marine rocks in a similar environment within a precious metal-rich volcanic arc. The RDN property, located 40 kilometres north of Eskay Creek, is underlain by strata that correlate with the Eskay sequence and fulfils these criteria. In addition, it demonstrates a number of regional-scale indicators considered important for the development of a stratiform, shallow marine volcanogenic massive sulphide Au-Ag deposit like Eskay Creek. Underlying strata correlate with the top of the Early to Middle Jurassic Hazelton Group. The property lies on the Harrymel/Forrest Kerr regional fault system, which may have localized felsic centres and rifting. Bimodal vol-

canism occurs with felsic and basaltic end members. The basalt analysed from RDN is chemically and texturally similar to Eskay Creek's, indicating local rifting. As well, the felsic volcanic rocks include a felsite sill that is chemically similar to the Eskay Rhyolite. Evidence of shallow marine deposition is strong: pillows in the basalts, peperites and shallow water fossils. Volcanic centres are indicated by potassic feldspar-megacrystic porphyry intrusions. These are pyritic and highly altered, indicating hydrothermal activity. Chemical analyses indicate that they are very similar to the Eskay Porphyry. Other favourable indicators include: widespread alteration of the felsic volcanic rocks and structurally-controlled Au-Ag-base metal veining within them; synvolcanic faulting that led to formation of restricted basins; low-sulphidation epithermal features, including elevated As-Sb-Hg contents and presence of orpiment, sulphosalts, chalcedony and pyrobitumen.

On the RDN property, the contact between footwall felsic volcanic rocks aging wall sequence of fine marine clastics and mafic volcanic rocks has been traced more than 9 kilometres. Drilling in 1999 and 2001 showed that this contact is depositional rather than tectonic and strengthened the stratigraphic and lithogeochemical analogy with Eskay Creek. Four targets on the property with potential for Eskay Creek-style stratiform sulphides are: the Wedge Zone, Jungle Anomaly, Marcasite Gossan and Boundary Zone. Compelling evidence at the Marcasite Gossan indicates that the two dacite domes identified were emplaced at or near the sea floor. Subsequent late magmatic to early hydrothermal fluids passed through the domes, causing widespread Kspar-silica flooding and stockwork veining, and vented to the sea floor where they deposited clastic massive sulphides. Although the Marcasite Gossan is deficient in base and precious metals, it demonstrates that volcanogenic massive sulphides were being deposited on the RDN property at the same felsic/basalt contact as stratiform orebodies at Eskay Creek. Evidence from the 2001 Wedge Zone drilling is less conclusive but the Wedge Zone appears to represent another shallow-marine hydrothermal system. At the Wedge Zone, however, Au and base metals are enriched, and a clast of massive chalcopyrite, possibly derived from stratiform sulphides, is present in a gold-bearing breccia at the top of the felsic section. The Jungle Anomaly and Boundary Zone have geochemical anomalies and high-grade veining in the vicinity of the "Eskay-equivalent" stratigraphic contact and require further testing.

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