FIRESTORM: PRECIOUS OPAL RELATED TO RHYOLITE IGNIMBRITE

By Paul Wojdak[1]

KEYWORDS: *Eocene, Buck Creek Formation, Ootsa Lake Group, basalt, rhyolite, ignimbrite, precious opal.*

LOCATION: Lat. 54°09'00"N,
Long. 126°00'60"W (93L/1E)

OMINECA MINING DIVISION. The property is 20 kilometres west of Burns Lake on the east side of Maxan Creek, 8 kilometres south of Maxan Lake.

CLAIMS: LODE 1-2 (2-post claims),
BOO (grid claim, 20 units)

ACCESS: Northwest from Burns Lake on Highway 16 for 15 kilometres to Decker Lake Forest Products Ltd. and then 27 kilometres south via the Maxan and Colleymount forest service roads.

OWNER: Dennis Schaefer (80%), Ross Beebe (20%)

OPERATOR: Cantec Ventures Inc.

DEPOSIT TYPE: Volcanic-hosted Precious Opal

COMMODITIES: Precious Opal

INTRODUCTION

Opal is hydrated amorphous silica consisting of spherical microcrystallites of α-cristobalite with 3-10% water trapped in the sub-microscopic centres of the spheres. In common opal the microspheres are randomly arranged but in precious opal they are ordered so that their diameter and spacing causes the trapped water to diffract light producing a play in bright flashes of red, green and blue colours. This feature imparts the value to precious opal. Opal can have a range in body colour, from clear ("jelly") to opaque black that may enhance the diffracted light and produce unique aspects to the stone. Precious opal contains more water than common opal and, because it is variably softer (Moh's hardness scale of 5.5-6.5), can be scratched. Precious opal from some areas is unstable. The included water, which is not chemically bound, may be lost with time or in a dry environment causing the opal to craze and negate the stone's value.

The Lode 1-2 claims are located on the east side of Maxan Creek valley where Goat Creek enters from the east (Figure 1). Opal exploration has focused in a small area of gently west-sloping, pine-forested land south of Goat Creek. The area has sparse outcrop but outcrop is more abundant in the steep-sided valley of Goat Creek where the open, sparsely vegetated north wall contrasts with the shaded and damp south wall. Thick moss and devil's club on the south wall mask important outcrops but, with careful work, lend insight into the genesis of the nearby precious opal. A short distance up Goat Creek, at the junction shown in Figure 2, a dramatic canyon incised by the stream is impassable.

HISTORY

In August 1998 Dennis and Lois Schaefer discovered opal, with a colourful play of internal reflection, in blocks of bedrock alongside the Colleymount Forest Service road about 250 metres south of the Goat Creek bridge. Common opal occurs on Eagle Creek (Minfile 93K 095) 10 kilometres to the east and is open to hobbyists and the general public under a No Staking Reserve. Dennis Schaefer staked the LODE 1 and 2 two-post claims and subsequently, the BOO 20-unit claim that encloses the LODE claims on the north, east and south sides. The discovery sparked staking of adjoining claims by Angel Jade Mines (OPAL claims), B.G. Miller (BJ claims) and Bruce Anderson (HOO claims).

In 1999 and 2000, the Schaefer family hand-trenched upslope from the road (Figure 2, Trench C) and recovered precious opal up to 92 carats in size with a suggested market value of $Cdn 15 000. The potential value of the material was recognized by various people, including George Simandl of the British Columbia Geological Survey and

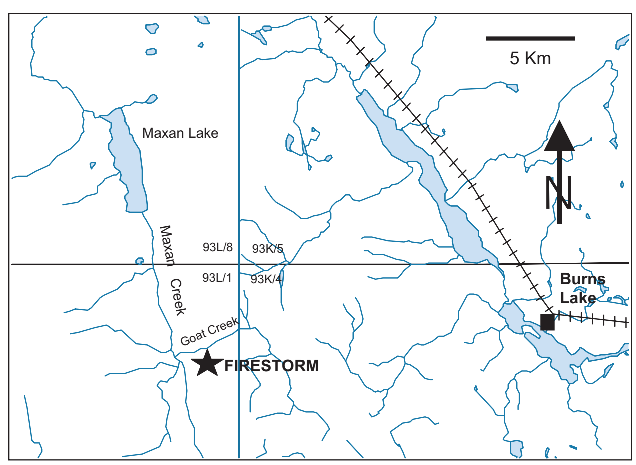

Figure 1. Location of Firestorm Opal property.Maxan Creek valley.

[1] *Regional Geologist,*
British Columbia Ministry of Energy and Mines

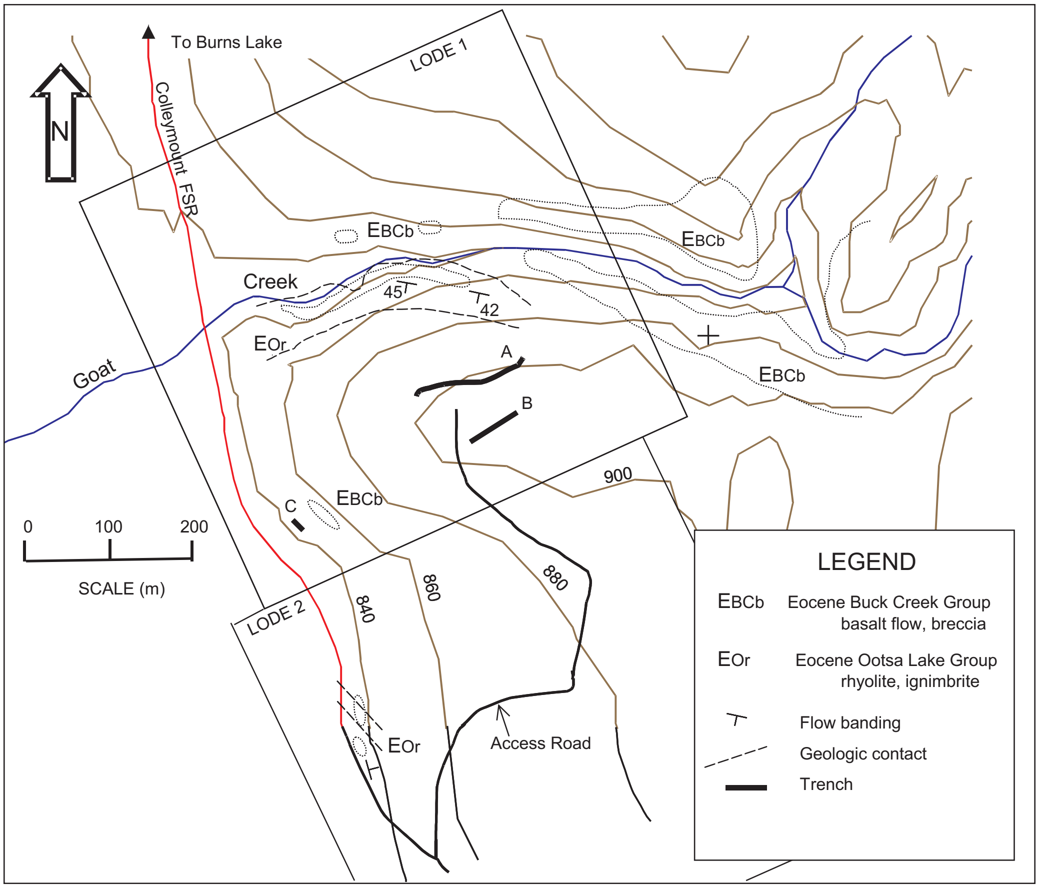

Figure 2. Geology of the Lode claims, Firestorm Opal property.

gemologist David S. Barclay. In 2000, Ross S. Beebe, of Westbank British Columbia, acquired 20% interest in the LODE and BOO claims. In 2001, Schaefer and Beebe reached agreement with Cantec Ventures Inc. to explore, develop and market precious opal from the Lode claims. During August and September 2001, Daniel Ethier supervised excavation and testing of a bulk sample at a site 250 metres from the discovery zone (Figure 2, trenches A and B), in an area located by Schaefer and Ethier in 2000.

REGIONAL GEOLOGY

The Burns Lake-Houston area is underlain primarily by an extensive cover of early Tertiary volcanic rocks that overlie volcanic, minor sedimentary and intrusive rocks of Mesozoic age (Church, 1972; Church and Barakso, 1990). Basement stratigraphic units comprise the Jurassic Hazelton Group, the lower Cretaceous Skeena Group and, in the eastern part of the area, the Early Jurassic Topley granite batholith. The Tertiary volcanic rocks mask Tertiary stocks, some of which are genetically related to overlying coeval flows. The Tertiary stock at the Equity Silver mine, 15 kilometres to the east, where erosion removed the Tertiary cover is an example. In conjunction with Tertiary volcanic activity, central British Columbia was subject to crustal extension that resulted in block faulting along an orthogonal set of northwest and northeast trending faults. A northwest fault of this set, with probable east-side-down displacement, trends along Maxan valley immediately west of the LODE claims (referred to herein as the Maxan fault).

Church and Barakso (1990) estimated that the Tertiary volcanic sequence is about 1500 metres thick. It consists of the Eocene Buck Creek, Goosly Lake and Tip Top Hill Formations (Church, 1972). The rocks are mainly andesite and basalt that other workers correlate with the Endako Group. Other workers correlate rhyolite in the area with the Ootsa Lake Group. Church (1972) concluded that the felsic volcanic rocks underlie the mafic lavas and inferred late Cretaceous age but he acknowledged that his interpretation was problematic. Church postulated reverse faulting to account for the inferred stratigraphic relationship but noted that the rhyolite could be Tertiary in age and intercalated with the Buck Creek assemblage. This is an important point because newly recognized rhyolite in the Goat Creek valley is intercalated with mafic lavas mapped as Buck Creek Formation by Church.

GEOLOGY OF THE LODE CLAIMS

The predominant lithology on the Lode claims is vesicular lava and flow breccia of mafic composition, called basalt herein but determined regionally to be basaltic andesite

Photo 1. Basalt flow breccia on the open slopes north of Goat Creek.

Photo 2. Precious opal, about 1.5 cm in size, fills vesicle in basalt. Nearby vesicle contains only a thin rind of silica (photo courtesy of George Simandl).

by Church (1972). Colour ranges from dark grey to chocolate brown to brick red. The texture ranges from aphanitic to very fine grained with feldspar microlites. Locally, the rock contains abundant spherules, up to 1 cm in size, of dark brown to black volcanic glass or palagonite (hydrated glass). Some spherules exhibit concentric banding, a bubbled interior surface and a hollow core. These textures superficially resemble agate and opal, which are also present in the basalt.

Vesicular lava is the main lithology along the Colleymount road, both on the Lode claims and to the north. Flow breccia predominates in Goat Creek valley and comprise poorly bedded outcrops up to 5 metres high (Photo 1). The clasts are up to 10 centimetres in size and consist of aphanitic to vesicular basalt similar to the lava flows. In a few places where individual flows can be discerned, they are two to three metres thick and consist of vesicular lava that passes upward into oxidized, red flow breccia. The flows are sub-horizontal in attitude. Dip ranges from flat in Goat Creek canyon to 10° north in Trench B (Daniel Ethier, pers. comm., 2001).

Vesicles comprise up to 20% of the basalt. The cavities are typically 5 mm in size but range up to several centimetres. Their shape varies from spherical to flat (almond-like). Large flat cavities tend to be interconnected or branching. In Trench C, opalized vesicles are adjacent to a vertical opal-filled fracture (A.E. Soregaroli, pers. comm., 2002).About 5% of the vesicles are filled, apparently on a random basis, with blue-green celadonite, agate, opal, calcite and, rarely, an unidentified zeolite. Common opal is abundant and, locally, fine specimens of precious opal are found (Photo 2). Precious opal is generally translucent ("jelly" colour) with flashes of red and green colour.

Rhyolite crops out for about 200 metres along Goat Creek, some 40 to 50 metres in elevation below Trenches A and B. Typically pale grey in colour, the rock contains 5-10% quartz phenocrysts (1-6 mm in size), 5% feldspar and 1% biotite (both 1-3 mm in size). At one locality, columnar jointing is well developed (Photo 3) and several outcrops exhibit flow-banding (Photo 4). The columnar joint set is perpendicular to the flow bands and indicates a

Photo 3. Columnar jointed rhyolite ignimbrite on Goat Creek, outcrop obscured by moss.

Photo 4. Fluid banding in rhyolite ignimbrite, same outcrop as Photo 3.

moderate southerly dip (40° to 45°), an orientation that is inconsistent with the basalt flows. An interesting, highly irregular contact of the rhyolite with underlying basalt is well displayed for a 20 metre distance in Goat Creek. The basalt is decomposed to a red, soft and friable material. At each end of the 20 metre span, the contact with the rhyolite is vertical but within a few metres becomes horizontal. There is no evidence of a faulted contact. The rhyolite is interpreted to be a flow that was deposited on the uneven, perhaps channeled surface of the basalt. The upper contact of the rhyolite is not exposed.

Throughout the Goat Creek body, the rhyolite has a spongy, porous texture and a related streaky, mottled fabric that is subtly distinct from flow banding. Feldspar and some quartz phenocrysts are corroded leaving pitted pseudomorphs (Photo 5). Corrosion begins in the core of the crystal, and preserves a fresh, euhedral rim. Under a microscope, the spongy pores and corroded crystals are seen to be lined with minute quartz crystals. This texture is interpreted to have formed by streaming of magmatic vapour through the rhyolite. Normally, rhyolite magma is viscous and does not flow well but gas-charged rhyolite is very fluid. Such eruptions are called ash flows, or ignimbrites, and produce laterally extensive, columnar-jointed deposits (Ross and Smith, 1961).

Rhyolite also crops out in the cutbank of the Colleymount road (Figure 2). It is compositionally similar to the Goat Creek body but does not exhibit columnar jointing, flow banding or spongy texture. It might be a dike rather than a flow. Its contact with nearby basalt is obscured but appears to trend southeast. Ten kilometres north of the Lode claims, near Maxan Lake, very similar quartz-feldspar-biotite porphyritic rhyolite is well exposed in a small quarry adjacent to the Colleymount road. Church and Barakso (1990) mapped it as a north-northwest trending body adjacent to the Maxan fault.

DISCUSSION

The geological characteristics of volcanic-hosted precious opal has been summarized by Paradis *et al* (1999). The mechanism of formation of siliceous deposits (agate and opal) in silica-deficient basalt has been a subject of debate for many years. Pabian and Zarins (1994) carried out an international study and derived a model for the formation of basalt-hosted agate deposits. They argue that rhyolite ash flow tuff (ignimbrite) is a necessary component of the volcanic sequence. Diagenesis of the glassy ash is the primary source of silica. Groundwater from alkaline lakes, heated by on-going volcanic activity, can leach silica from the ignimbrite and transports it as a gel. Redeposition of the silica as spherulitic layers in basalt vesicles is triggered by an electrochemical reaction.

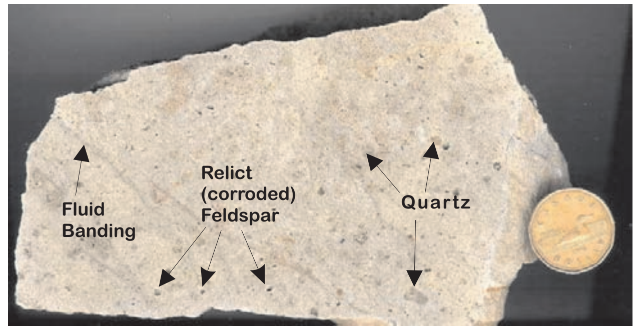

Photo 5. Rhyolite ignimbrite, showing phenocrysts of quartz and corroded feldspar.

No pumice fragments have not been identified in rhyolite on the Lode claims. Ross and Smith (1961) state that pumice fragments provide the single most important criterion for identifying the pyroclastic origin of ash-flow tuff (ignimbrite). However, they go on to point out that the recognition of pumice fragments may be obscured by welding, devitrification and vapour-phase crystallization. Pumice fragments might be present in the Goat Creek rhyolite, but hidden by vapour-phase leaching and the resultant mottled, streaky texture. Ignimbrites commonly have a very uneven base, due to eruption onto uneven topography, and a nearly level top in contrast to the blanketing of topography by ash fall tuffs.

The Pabian and Zarins model implies that the best area to search for precious opal is in vesicular basalt proximal to rhyolite ignimbrite. In the Burns Lake area, these eruptions may have been controlled by Tertiary down-drop faults, such as the Maxan fault.

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