INDUSTRIAL MINERALS IN THE TERTIARY OF THE BONAPARTE TO DEADMAN RIVER AREA, SOUTHERN BRITISH COLUMBIA*
(92I/14, 15; 92P/02, 03)

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KEYWORDS: Industrial minerals, bentonite, zeolites, diatomaceous earth, Eocene stratigraphy, Kamloops Group, Deadman River Formation.

INTRODUCTION

This report summarizes results of 31 days of fieldwork investigating the occurrence of industrial minerals, and those aspects of the Tertiary stratigraphy which control their development in the area between Bonaparte and Deadman rivers. In this area, the industrial minerals of major interest are bentonite and zeolites in the Eocene Kamloops Group, and diatomaceous earth in the Miocene Deadman River Formation. In addition to the regional geology of Monger (1982) for Ashcroft map area (92I), and Campbell and Tipper (1971) for Bonaparte Lake map area (92P), McCammon (1960, pages 181 to 185) described volcanic ash and its pozzolanic properties at Sherwood Creek to the north of the study area; Cockfield (1948, page 149) and Hora (1986, page 239) reported on the Red Lake diatomite, now in production as "fuller's earth" under the ownership of DEM Resource Processors Ltd., to the east of the study area; and Read (1987) discovered zeolitized tuffs (heulandite-clinoptilolite) in the Cache Creek Hills north of McAbee. Laboratory investigations of samples are in progress, but tests of materials relative to ASTM specifications have not yet started.

TERTIARY STRATIGRAPHY AND STRUCTURE

Because the basal parts of the Kamloops and Chilcotin groups locally contain the necessary sedimentary rocks to host industrial mineral occurrences, these portions of the stratigraphy were examined in detail. Between the Bonaparte and Deadman rivers, more than a 1000-metre thickness of mainly volcanic rocks of the Kamloops Group lie on a pre-Tertiary basement with more than 300 metres of relief (Figure 3-9-1). The rocks lie in an open, northwesterly trending syncline strike-slip faulted on the east by the north-northwesterly striking Deadman River fault. The basal 500 metres of the group contains lenses of volcanogenic sediments up to 9 kilometres long and 200 metres thick, which locally host zeolite and bentonite occurrences. More than 300 metres of the undeformed Chilcotin Group overlies the Eocene and older rocks on a basement with more than 400 metres of relief. Rhyolite ash, minor siltstone, sandstone and pebble conglomerate, and rare diatomaceous earth comprise the Miocene Deadman River Formation which is the lower part of the group. The formation includes fluviatile deposits filling deep river channels, such as the one exposed east of Gorge Creek, and probable lacustrine accumulations such as the one poorly displayed northwest of Red Lake. The Chilcotin Group is more extensive than previously mapped in the Ashcroft map area (compare Monger, 1982). In the vicinity of Deadman River. the erosional remnants outline a southward draining Miocene river valley that closely coincides with the present position of the river.

INDUSTRIAL MINERALS IN THE KAMLOOPS GROUP

ZEOLITES

Up to 500 metres above the base of the Eocene succession are conglomerate, lithic sandstone, shale and zeolitized tuffaceous lenses. Of the two lenses described north of McAbee (Read 1987, page 253), a section through the 89-metre-thick western lens has been sampled every metre in its exposed portions. Waterlain, zeolitized acid tephra locally underlies the upper 4 metres of the lens, and forms a 10-metre-thick bed near the middle of the lens. A thermal stability investigation of the zeolitized samples shows that heulandite and heulandite-rich intermediate compositions predominate and that clinoptilolite occurs only near the margins of the 10-metre-thick bed. The low cation exchange capacity (CEC) of sample 424B from the upper part of the lens also indicates heulandite (Table 3-9-1).

The thickest sedimentary lens forms a 9-kilometre-long line of cliffs up to 200 metres high on the west side of Deadman River between Clemes and Gorge creeks. A grey-brown andesite cobble to boulder conglomerate occupies the

TABLE 3-9-1
EXCHANGEABLE Ca, Na, K AND Mg ANALYSES AND CATION EXCHANGE CAPACITY (CEC)

Sample	Exchangeable Cation Analysis (milli-equivalent/100g)					CEC (milli-equivalent /100g)
	Mg	Ca	K	Na	Total	
C86-424B	4.4	9.6	5.6	8.1	27.7	22.3
C86-424B	4.8	12.5	7.5	12.3	37.1	28.1

* This project is a contribution to the Canada/British Columbia Mineral Development Agreement.

British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1987, Paper 1988-1.

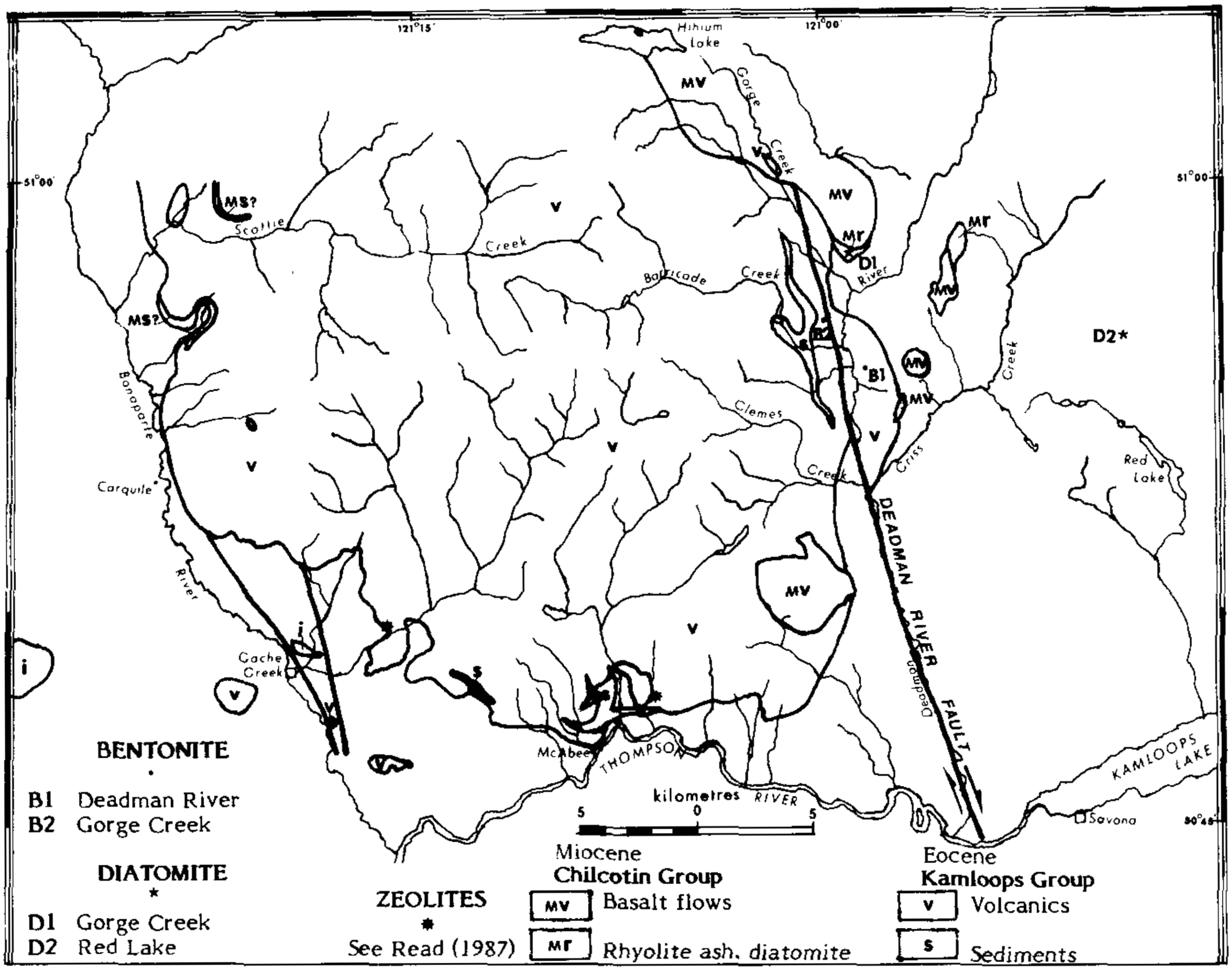

Figure 3-9-1. Simplified geological map of the area between Bonaparte and Deadman rivers showing the industrial mineral occurrences.

lower part of the lens, a white-weathering, glassy rhyodacite(?) pebble to cobble conglomerate or breccia occupies the middle, and andesite or rhyodacite layered tuffs up to a few metres in thickness are scattered throughout. This conglomerate lens may be the proximal portion of a fan delta whose distal segment consists of the two sedimentary lenses of volcanic conglomerate and overlying sandstone, shale and zeolitized tuff exposed north of McAbee. Bedded lithic andesite tuff and tuffaceous wacke form lenses up to a few tens of metres in thickness and hundreds of metres in length which outcrop up to 5 kilometres southeast of Carquile. An X-ray diffraction investigation of 77 samples from these lenses shows that only those lenses previously described are zeolitized (Read, 1987).

BENTONITE

From a kilometre north of Clemes Creek to a kilometre north of Gorge Creek, landslide debris underlies Deadman River and mantles the valley walls up to 1070 metres (3500 feet) in elevation. The most extensive slides are from the east or dip-slope side of the valley where an approximately 60-metre-thick bentonite-rich layer (B1), with intercalated fine volcanic breccia layers, outcrops for a kilometre along strike near the base of slope. It is best exposed at FM0642650mE, FM5643150mN and 690 metres (2250 feet) elevation. On the west side of the valley from Barricade to Gorge creeks, bentonitic volcanic breccia and bentonite-rich lenses up to a few tens of metres in thickness are scattered throughout the andesite breccia that underlies the sedimentary lens. Ferrier's (Keele, 1920, page 161) and Cockfield's (1948, page 150) descriptions of bentonite near the mouth of Gorge Creek (B2) probably apply to bentonite-rich layers in andesite breccia exposed at FM0641000mE, FM5645800mN and 750 metres (2450 feet) elevation.

INDUSTRIAL MINERALS IN THE CHILCOTIN GROUP

DIATOMACEOUS EARTH

North of the junction of Gorge Creek and Deadman River (D1), float of diatomaceous earth occurs in roadcuts at FM0648100mE, FM5648200mN. It must subcrop between the roadcuts at 1010 metres (3300 feet) elevation and the base of the overlying olivine basalt flows at 1110 metres (3650 feet). Between 9 and 14 kilometres north of the mapped area, on the north side of Sherwood Creek, Campbell and Tipper (1971, Section 2-2TD-1964) reported a minimum aggregate thickness of 4.3 metres of diatomaceous earth in two beds lying within 41.5 metres of the base of the section; and 3.8 metres in two beds lying within 50.9 metres of the base of Section 1-2TD-1964 on the east side of Deadman River at the north end of Skookum Lake (Campbell and Tipper, 1971, page 56). Six kilometres east of the mapped area, diatomaceous earth material up to 37 metres in thickness has been outlined over an area of 64.8 hectares at the deposit of DEM Resource Processors Ltd. at Red Lake (D2). Because the Deadman River Formation is incompletely mapped and exposures are restricted to roadcuts, the diatomaceous earth potential of the area has not been adequately assessed.

VOLCANIC ASH

Massive rhyolite ash underlies olivine basalt flows in the Miocene residua north of Gorge and Criss creeks. Farther north, near and in Scottie Creek valley, are two lenses up to 100 metres thick and 3 kilometres long which consist of rhyolite ash containing layers of andesite volcanic conglomerate with clasts lying in the acid tuff matrix. Because similar rocks occur in the Kamloops Group and both of these lenses lack overlying olivine basalt flows, they are correlated only tentatively with the Chilcotin Group. Outside the mapped area, volcanic ash is present at Sherwood Creek and farther north (Keele, 1920, pages 161 and 162; Eardley-Wilmot, 1927, pages 85 to 89). At Sherwood Creek, McCammon (1960, page 180) tested the ash for its pozzolanic properties. Although it meets ASTM specifications, it has not been used as a pozzolan nor has it found use as a cream glaze on ceramic ware (McCammon, 1960) or as an abrasive (Eardley-Wilmot, 1927).

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