COAL ASSESSMENT IN THE BAY ST. GEORGE CARBONIFEROUS BASIN

by

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INTRODUCTION

A field investigation of coal deposits of the Bay St. George Carboniferous Basin was carried out during the month of July and the first week of August, 1981. These deposits occur in the Barachois Group of sedimentary rocks which are the youngest rocks in the area. Coal seams occur along Middle Barachois Brook and in two small localities in the Codroy Valley near South Branch and Tompkins. It has been dated as Westphalian A (Utting, 1966) and is equivalent to the Riversdalian of the Maritime Provinces (Hacquebard *et al.*, 1960). The coal was graded as high volaatile B bituminous and classed as lower rank, with between 47 to 70 percent free carbon, 3-24 percent ash and 1-8 percent sulphur (Hayes, 1949).

Periodic investigations of the Barachois Brook coal were carried out in the last century (Murray, 1873; Fletcher, 1874; Howley, 1897) and continued until the middle of this century (Dowling, 1920; Baker, 1927; Bryan, 1938; Hayes, 1949). The latter two assessments concluded that the coal seams which had been somewhat exaggerated in their thicknesses by the early reports, were in fact thin, impure, and discontinuous, and also greatly disturbed by folding and faulting. For a more detailed account of the above investigations and their results, readers are referred to the review of coal in the Bay St. George Basin by Knight (1979).

The 1981 field work concentrated mainly on the coal occurrences on Middle Barachois Brook. The project was aimed at obtaining a better definition of the location, size, quality and geological setting of the coal seams.

Detailed (1:1,000) geological mapping was carried out and coal seams were sampled. Some VLF-EM lines were run as a supplement to the mapping, mainly to trace faults. Scintillometer readings were recorded over outcrops and coal seams.

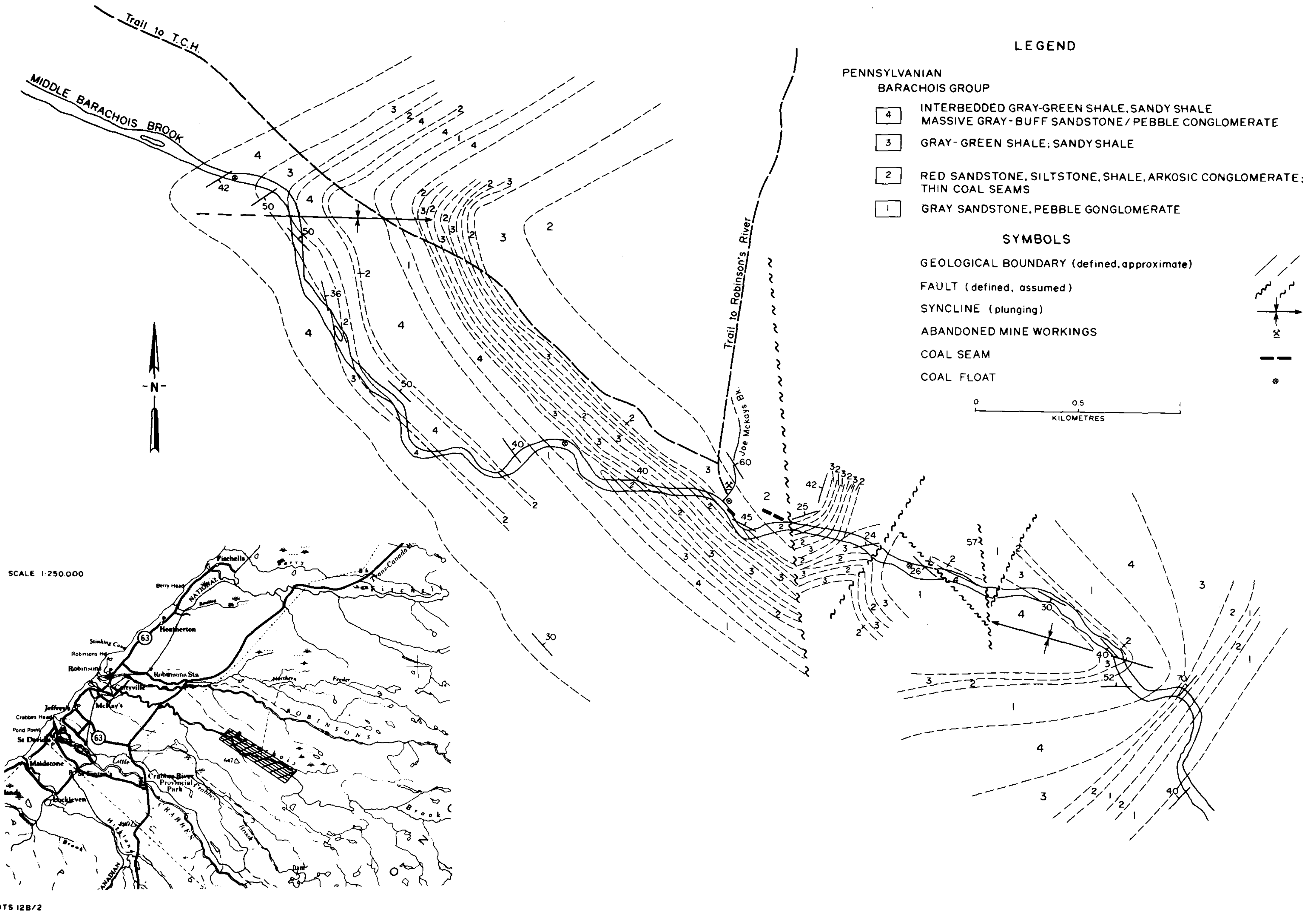
GEOLOGY

Repetitive sedimentary lithologies occur along Middle Barachois Brook. They consist of gray sandstone and pebble conglomerate (1), red sandstone, siltstone, shale and arkosic conglomerate (2), gray-green shale, sandy shale (3) and interbedded gray-green shale and massive gray-buff sandstone/pebble conglomerate (4). The beds dip steeply and define a curving basin-like structure interpreted to be a doubly plunging syncline. Coal seams are associated with the uppermost strata in the syncline.

The strata are complexly folded and faulted as evidenced by the variance in bed attitude and the shattered nature of some outcrops, particularly in the area immediately west of Joe McKay's Brook. A major fault is postulated to run in an approximate north-south direction about 500 m east of Joe McKay's Brook. Although its existence was first based on geological data, geophysical evidence was provided by a VLF-EM profile, run normal to the fault's projected strike. The line, located about one kilometre north of the brook, detected a conductive zone believed to be caused by water-filled shears associated with the fault.

UNIT 1

This unit, consisting of gray sandstone and pebble conglomerate, was observed most frequently in the stream


LEGEND
PENNSYLVANIAN
BARACHOIS GROUP
4 INTERBEDDED GRAY-GREEN SHALE, SANDY SHALE
MASSIVE GRAY-BUFF SANDSTONE / PEBBLE CONGLOMERATE
3 GRAY-GREEN SHALE; SANDY SHALE
2 RED SANDSTONE, SILTSTONE, SHALE, ARKOSIC CONGLOMERATE; THIN COAL SEAMS
1 GRAY SANDSTONE, PEBBLE GONGLOMERATE
SYMBOLS
GEOLOGICAL BOUNDARY (defined, approximate)
FAULT (defined, assumed)
SYNCLINE (plunging)
ABANDONED MINE WORKINGS
COAL SEAM
COAL FLOAT
0 0.5
KILOMETRES
Trail to T.C.H.
MIDDLE BARACHOIS BROOK
Trail to Robinson's River
Joe McKays Bk.
-N-
SCALE 1:250.000
NTS 12B/2
INDEX MAP

bed beginning at a point about one kilometre east of the mouth of Joe McKay's Brook. This is a structurally complex area where the bedding has been greatly fragmented by faulting. The unit was observed in fault contact with shales and sandstone of Unit 4 in two locations. Along the eastern part of the mapped area, it appears to form a cyclic pattern with shale and sandy shale of Unit 2. The unit is typically massive and well bedded. Fossil plants are common with plant stems up to 20 cm in diameter observed.

UNIT 2

This unit consists of red sandstone, siltstone, shale and arkosic conglomerate and occurs throughout the mapped area, but becomes particularly prominent towards the centre of the basin where red sandstones, siltstones and shales form a cyclic repetitive pattern with the green shale and siltstone of Unit 3. These rocks are especially significant in that coal has been identified with them. On the north bank of Middle Barachois Brook, about 320 m upstream from the mouth of Joe McKay's Brook, an exposed section shows a 0.5 m thick coal seam capped by a 4 m band of carbonaceous black shale and overlain and underlain by red shale and sandstone beds averaging 1.3 m thickness. The red sandstone bed immediately underlying the coal contains abundant fossil plants and impressions.

Crossbedding both on a micro and macro scale was observed in several outcrops of red sandstone and shale. In one outcrop of red sandstone, the crossbedding is accentuated by very thin, light gray sandstone laminations. Another outcrop of fine to very fine grained red shale near the mouth of Joe McKay's Brook displays small scale crossbedding indicating paleocurrent from the south.

UNIT 3

Gray-green shales and sandy shales of Unit 3 appear to form a cyclic pattern with the red sandstone, siltstone and shales and this feature becomes more apparent towards the centre of the basin. One outcrop of fine grained, greenish-gray shale contains cobble-size dropstones indicating tops upward. Fine grained greenish shale with abundant hematite streaks and laminations was also observed. Well defined mud cracks were noted in a large exposure of massive fine grained greenish-gray sandy shale. Ripple marks indicating a paleocurrent from south to north were also noted in an outcrop of greenish gray shale.

UNIT 4

Relatively wide zones of interbedded gray-green shale, sandy shale and massive gray-buff sandstone/pebble conglomerate occur throughout the map area. In one typical outcrop, the beds average 1 m thick and consist of massive, fine grained gray sandstone overlain by gray shale and greenish-gray sandy shale overlain by coarse grained, buff-colored pebble conglomerate. The latter consists of 10-20% subrounded quartz-feldspar pebbles averaging 1-3 cm in a fine to medium grained greenish sandy matrix. Fining upward textures were observed in some of the sandstone beds.

Unit 4 also includes mottled, rusty clayey siltstone beds bearing carbonate nodules. In one outcrop, 10 such beds were noted, separated by highly weathered, dark gray-black shaly mudstone. About 3.2 km west of Joe McKay's Brook and on the south bank of the brook, interbedded highly weathered carbonaceous black shales (1-10 cm thick) and fine to very fine grained light gray sandstone beds (10-30 cm thick) are underlain by mottled greenish gray nodular shale. Small weathered out fragments of coal were found associated with the carbonaceous shale. These fragments have been sampled for analysis.

In some of the gray sandstones, fossil plants are fairly common usually in the form of tree fragments and bark. Well preserved ripple marks and mudcracks are also present especially in outcrops which have undergone fracturing along bedding planes so that relatively fresh unweathered surfaces have been exposed by recent landslides.

COAL OCCURRENCES

The best exposed coal seam was observed on the north bank of Middle Barachois Brook about 230 m upstream from the mouth of Joe McKay's Brook. It consists of a 0.5 m wide seam of hard, bright coal overlain by 0.4 m of carbonaceous black shale and at least three beds of red shale and sandstone averaging 1.3 m in thickness. The coal seam is underlain by fine grained reddish sandstone with abundant plants and impressions which, in turn, is underlain by a 1.5 m bed of dark gray to black shale. A moderately massive, fine grained red sandstone is the lowest unit that can be identified in the section. The coal seams widen to about 0.7 m about 20 m along its northwest strike, thus suggesting a lenticular shape. There is also evidence that the seam grades into shale along its southeastern projection, although there the strata is obscured by overburden and faulting.

The section described above is obscured by broken bedrock and organic material near and at the top of the river bank. It is interesting to note that the broken rock includes, and in places is covered with, coal fragments. This strongly suggests the presence of another, stratigraphically higher coal seam, probably within 8 m (vertical distance) of the exposed seam.

A 30 cm weathered coal seam was located in the stream bed about 110 m east of the mouth of Joe McKay's Brook. The coal is underlain by massive fine grained sandstone and overlain by gray-black shale. The seam can be traced along its northwesterly strike for only two or three metres and is visible only when the water level is low.

Weathered out coal chips were located associated with thin carbonaceous black shales about 3.2 m west of Joe McKay's Brook and have already been described earlier in this report.

No *in situ* coal was found amid the old mine dump and workings noted in the stream bed and on the west bank of Joe McKay's Brook.

GEOPHYSICS

The VLF-EM surveys, though ineffective in tracing coal seams, proved useful in helping to confirm the existence of a major fault which crosses Middle Barachois Brook immediately east of the coal seams. This fault was first shown by Hayes (1949) from geological data recorded in the stream bed. A VLF-EM line run normal to the faults projected strike about 800 m north of the brook detected a conductive zone believed to be caused by water-filled shears associated with the fault.

Scintillometer readings were recorded over most of the outcrops in the map area. Carbonaceous rocks and soils characteristically yield higher counts (2-3 times background). The highest reading (1800 cps) was recorded over a 30 cm band of highly weathered black carbonaceous clayey material. This band was underlain by weathered rusty, mottled, gray siltstone (paleosol) (900 cps) and overlain by thin bands of gray siltstones and shales (500-600 cps).

The coal seam in the stream bed near Joe McKays Brook gave a reading of 850 cps compared to a background of 750 cps for its host rocks.

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