

# MAR 19680093: MIKKWA RIVER

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ECONOMIC MINERALS  
FILE REPORT No.  
S-AF-105(1)

PRELIMINARY GEOLOGICAL REPORT  
SULPHUR PROSPECTING PERMIT #105  
19680093

PRELIMINARY GEOLOGICAL REPORT  
SULPHUR PROSPECTING PERMIT #105  
Mikkwa River Area North Central Alberta  
Prepared for L. C. Johnston, Abilene, Texas, U. S. A.

INTRODUCTION

This report has been prepared at the request of Mr. L. C. Johnston, the present holder of sulphur prospecting permit #105. This permit, covering a total of 39,600 acres, was issued on January 16, 1968. Winter conditions did not permit a preliminary field examination of the properties; therefore, this report covers only that information available from the published and unpublished data.

The property is described as follows:

- (A) Township 102 Range 3 West of the Fifth Meridian
  - 1. Sections 15 to 22, inclusive
  - 2. Sections 27 to 34, inclusive
- (B) Township 103 Range 3 West of the Fifth Meridian
  - 1. Sections 1 to 36, inclusive
- (C) Township 104 Range 3 West of the Fifth Meridian
  - 1. Sections 1 to 10, inclusive.

The permit is located approximately 60 miles southeast of the town of Fort Vermilion. The property is readily accessible during the winter months to wheeled drilling equipment via several seismic lines that cross the area and bulldozing new

lines where necessary. Summer drilling can be accomplished by tracked equipment by using existing seismic lines; however, the cost of opening new lines during summer months would be prohibitive.

Deposits of elemental sulphur beds have been reported from many localities in northern Alberta and the southern portion of the Northwest Territories as early as 1910. In many instances, these deposits were often found around sulphur water springs and/or gas seeps. Sulphur deposits have also been observed as thin interbeds with shale deposits and infilling of cavities in porous carbonate rocks at a few localities where outcrops are exposed along stream channels.

Very little attention was given to these sulphur occurrences in past because the supply of sulphur exceeded the demand. Price increases and growing world demand for sulphur renewed interest in these deposits. H. L. Hunt and associates, after several months of surface reconnaissance, filed sulphur prospecting permits #8, #9 and #10. Surface samples assayed as high as 95% elemental sulphur. This announcement activated a large land play wherein some six million acres in the vicinity of the Hunt permits were filed on. The permittees included many major companies as well as small companies and individuals.

The time element precluded the opportunity of detailed study or surface reconnaissance, and many permits were filed solely on the basis of proximity.

Relation of Regional Geology to the  
Sulphur Deposits

The geologic process by which the sulphur deposits were emplaced, their frequency of occurrence, the possible extent or size of an individual deposit are as yet unknown. On the basis of what little exploratory work that has been done at this time, the prospects are highly encouraging that this area will eventually be a commercial producer.

Over the past three months, several companies have carried out preliminary shallow drilling programs to take advantage of winter drilling conditions. The results are being held confidential; however, in several instances, additional follow-up drilling is planned for the 1968-69 winter season. At least two tracked drilling units will be located in this area to carry out summer drilling programs.

The sulphur occurs in the amorphous state and in the monoclinic and rhombic crystalline forms. Two hypothesis as to the origin of sulphur are currently in use. The first theory suggests that the sulphur deposits are the result of sulphur bearing waters and gases moving up to dip to outcrop or sub-crop

edges of the Upper Devonian Grosmont reef and the Middle Devonian Keg River or its equivalent termed the Methy Dolomite. In other instances, fault planes are believed to be the escape route of the waters and gases from the underlying reefs. Several sulphur springs, bubbling water and gas surrounded by elemental sulphur deposits support this theory.

The second possible source of the sulphur is believed to be the decomposition of the vast sulphate deposits of the Middle Devonian Elk Point Group. The chemistry of the decomposition of calcium-magnesium sulphates into elemental sulphur can be accomplished experimentally. In nature, it is assumed that the process involves bacterial action in conjunction with moving subterranean waters and hydrocarbons. The impurities of both magnesium and sulphate in widely varying proportions found with elemental sulphur tend to support this hypothesis.

It is highly likely that future study will demonstrate that both processes contributed to the origin of these sulphur deposits. The presence of magnesium as an impurity could develop into a valuable by-product.

#### Recommended Evaluation Program

The photogeologic evidence of faulting in the near vicinity and the occurrence sulphur springs nearby, particularly

on Lambert Creek, indicates the likelihood of finding sulphur deposits on permit #105. The following evaluation program is recommended.

1. A photogeologic study of the aerial photographs to locate surface expression of faulting, sulphur springs and possible vegetation kill.
2. The possible use of infra-red photography to determine a relationship between thermal activity and sulphur deposition.
3. A surface examination to verify data revealed through the airphoto study. A portable augur for shallow holes to test any surface deposits of sulphur.
4. A shallow drilling program be initiated, if warranted, to roughly delineate any sulphur deposits found.

Respectfully submitted by



J. W. Worobec  
Geologist

# SULPHUR PROSPECTING PERMIT No. 105

CANCELLED  
LYLE JOHNSTON,  
734 CITIZENS BANK BLDG.,  
TYLER, TEXAS, U.S.A.

DATE OF ISSUE - JANUARY 16, 1968  
AREA - 39, 680 ACRES

NO LEASE SELECTED.

TP. 104

TP. 103

CORRECTION LINE

84 G 11 LN E  
84 J 1 SE

TP. 102

R. 3

R. 2 W. 5 M.