MAR 19680117: NORTHERN ALBERTA

Received date: Dec 31, 1968

Public release date: Jan 01, 1970

THIS REPORT HAS BEEN PREPARED
FOR THE EXCLUSIVE USE OF:

Stampede Oils Ltd.

COPY NO: 2

PHOTOGEOLOGICAL STUDY

SULPHUR PROSPECTING PERMITS NOS. 135 AND 136

NORTHERN ALBERTA

Prepared For

Stampede Oils Ltd.

July, 1968

J. C. SPROULE AND ASSOCIATES LTD.
OIL AND GAS ENGINEERING AND GEOLOGICAL CONSULTANTS

1009 FOURTH AVENUE S.W.
CALGARY – ALBERTA

TELEPHONE 269-7951

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

PHOTOGEOLOGICAL STUDY

SULPHUR PROSPECTING PERMITS NOS. 135 AND 136

NORTHERN ALBERTA

INTRODUCTION

This report has been prepared at the request of Mr. A.A.W. Kryczka acting for Stampede Oils Ltd., hereinafter referred to as the "Company." The request made was for a photogeological analysis of the Company's Sulphur Prospecting Permits Nos. 135 and 136, integrated with other available geological information. A map of North-Central Alberta, Figure 1, shows the general geological setting of the Company Permits and their relationship to other sulphur permits in the area. Figure 2 represents the results of this preliminary study on a photogeological mosaic.

The immediate objective of this photogeological study was to identify from the study of aerial photographs those areas that, from our present knowledge, would be the most favourable for the occurrence of sulphur. Such areas could then be examined in the field to determine the presence or absence of sulphur.

Sulphur Prospecting Permits Nos. 135 and 136 total approximately 39,680 acres; 19,840 acres per Permit.

BEDROCK GEOLOGY AND TOPOGRAPHY

Sulphur Prospecting Permits Nos. 135 and 136 are located in the Caribou Mountains, some 70 and 40 miles, respectively, northeast of Fort Vermilion. In these Permit areas, the bedrock consists of Cretaceous shales and sandstones to depths of about 1,500 feet and more than 2,000 feet, respectively. The Cretaceous-Devonian boundary runs in a southwest-northeast direction between the Caribou Mountains and the Peace River, approximately through Sulphur Prospecting Permit No. 8, the discovery Permit (see Figure 1).

Sulphur Prospecting Permit No. 135 is located along the east side of Wentzel Lake in the Caribou Mountains. The northwest-trending scarp near the centre of the Permit (Figure 2) essentially follows the 2,500-foot topographic contour. To the northeast of this scarp, the surface rises gradually to approximately 2,950 feet in elevation. To the southwest, a more abrupt topographic change occurs as the ground surface drops into the Wentzel Lake Valley, which is approximately 2,150 feet above sea-level.

Sulphur Prospecting Permit No. 136 is also located in the Caribou Mountains and is drained by the Lawrence River and its tributaries. A plateau-like topography occurs in the eastern part of the Permit. This fairly flat area ranges in elevation from 3,000 feet to 3,100 feet, except locally along stream channels. The upper part of the Lawrence River valley occupies the western part of the subject Permit area. The average surface elevation here is approximately 2,500 feet.

MODE OF OCCURRENCE AND RELATIONSHIP OF SULPHUR TO GENERAL GEOLOGY

Within the general area of interest in which sulphur prospecting permits have been issued (Figure 1), the principal bedrock formations are of Cretaceous age, but, to the north and northeast, erosion has stripped off the Cretaceous beds exposing older Devonian rocks. The Devonian, as well as overlying Cretaceous rocks, are generally inclined gently westward into the Alberta Syncline so that progressively younger rocks of both Paleozoic and Mesozoic ages are present in that direction.

The bedrock, whether of Devonian or Cretaceous age, is overlain by a variable thickness of glacial and related sediments. The thickness of these overlying sediments is generally at a minimum in those areas where river valleys are deeply incised and greatest in the hilly portions of the area.

The surficial geology of the area is of particular interest to the subject of possible economic occurrences of sulphur because of the probability that any economic deposits in this area are in surficial deposits.

The last glacier to cover the subject area was of Wisconsin age. Dating by 'carbon 14' method indicates that this advancement over the region occurred over 31,000 years ago. Ice flow features on the Glacial Map of Canada indicate that this glacier came from an area west of Hudson Bay. The thickness of the glacier is estimated to have been approximately 5,000 feet and the average direction of flow in the subject area was to the west-southwest.

The general absence of terminal moraines and other ice marginal features indicates that the retreat of the glacier was mainly by rapid stagnation. Dead-ice moraine forms the surface or underlies lacustrine deposits over much of the regional area.

As the glacier retreated, the lowland to the north was blocked by ice and meltwaters and could not drain freely. Extensive proglacial and superglacial lakes were formed, resulting in the deposition of glacio-lacustrine deposits that vary in thickness from a few inches to fifty feet or more.

It is, at this time, not clear as to what extent the sulphur is developed in surficial deposits and to what extent it may be present within the stratified deposits of the Cretaceous and/or Devonian, but both modes of occurrence may exist. The most likely commercial deposits are, however, probably surficial.

Sulphur occurrences in the general region may be broken into three groups, as follows:

(1) In muskeg or other poorly drained lacustrine or "dried lacustrine" areas. The most important known apparent example of this type is the Sulphur Prospecting Permit No. 8 discovery occurrence.

(2) Deposits of elemental sulphur in connection with active springs with or without associated gas. One such known occurrence involved gas, which was, at least in part, combustible.

(3) Cretaceous shales in the area frequently contain finely disseminated sulphur. Although we know of no reported concentrations of significant size from the Cretaceous, the possibility of such economic occurrences cannot be entirely eliminated.

In many parts of the general area, burnt shales have also been reported. These usually appear to be associated with recent slumps, possibly because the slumping brings the combustible material, which may include sulphur, in contact

with the surface. The origin of the combustion is, at this time, purely conjectural, but lightning produced forest fires are the most likely cause.

We are not prepared, at this time, to enter into detailed discussions of theories of the origin of the sulphur because of the large number of presently uncertain factors in this new area. Studies in the area are, however, likely to yield substantial information over the coming field season. Meanwhile, theories of origin from Paleozoic connate waters or from bedded Devonian and other gypsum and anhydrite deposits are of principal interest.

The manner of occurrence of sulphur deposits will determine whether they can be mined at the surface by stripping or from deeper strata by the Frasch process.

Solution of many of the questions of origin and occurrence is of prime economic importance and should be given very detailed attention as the present permit areas are evaluated.

Meanwhile, it is of general interest to the overall sulphur problem in this region that continuous flowing sulphur springs have been known in the area for nearly 200 years and that such springs are still known along a broad area along the Mesozoic-Paleozoic surface geological contact that extends from Western Saskatchewan, through the McMurray oil sands area, and across the present region of sulphur permits into the southern part of the Northwest Territories near Pine Point and westward along the Liard River. It is of further possible significance that there appears to be a genetic relationship between these sulphur occurrences and the McMurray oil, which has a four percent to five percent sulphur content. In addition to this, there is considerable free sulphur associated with the McMurray oil sands, both within and outside of the oil saturated area. As a measure of the amount of sulphur already known to have been deposited, probably

from the same type of connate waters that can be expected to have deposited the sulphur under study, we might refer to the "reserve" of the sulphur in the McMurray oil sands. Most recent estimates indicate that there is over 600 billion barrels of oil-in-place in the McMurray oil sands. This oil contains four to five percent of sulphur weighing approximately eight to ten billion long tons.

The above and other evidence available would indicate that what is needed to produce an economic sulphur deposit in this area is a favourable combination of faults and fractures for sulphate spring exits, sulphur supply in the connate waters and poorly drained lacustrine or other flat basin areas immediately adjacent to the spring exits. All these individual circumstances are known to exist. Under the proper combination of circumstances, there is no definite limit to the amount of sulphur that could be formed. Whether or not, or where, commercial deposits are present remains to be seen.

PHOTOGEOLOGICAL STUDY

WITH RECOMMENDATIONS FOR FIELD EVALUATION

Sulphur Prospecting Permit No. 135

Photo-alignments, interpreted to indicate bedrock faulting or fracturing, are present in the area of Sulphur Prospecting Permit No. 135. These fractures assume a general northwesterly trend through the middle of the Permit, but change to a west and southwest direction on either side.

The following areas are of special interest and should be checked in the field.

'Area 1' represents a group of depressional features containing small lakes, alluvium and muskeg. Associated with these depressions are a number of west to southwest-trending fractures. The area is one of special interest and field evaluations are recommended. Particular attention should be given to those areas along and adjacent to fractures.

In the northwestern part of the Permit area are several darker toned areas that appear to be dried up patches of muskeg. These features, designated 'Area 2' on the enclosed mosaic, should be examined in the field. Some shallow augering of selected sites would be advisable.

'Area 3' is located in the northeastern part of Sulphur Prospecting Permit No. 135. Scattered, small accumulations of water suggests imperfect drainage and the area should be field checked.

Sulphur Prospecting Permit No. 136

Sulphur Prospecting Permit No. 136 is characterized by a series of strong photo-alignments which are interpreted as bedrock faulting or fracturing. The most prominent of these seem to be aligned in a northwest-southeast direction that parallels major valleys and drainage.

The general region appears to be well drained, however, local small catchment basins away from main drainage channels exist. Where these depressions occur along or adjacent to apparent faults or fractures, they are of special interest and should be checked in the field.

The following areas are recommended for field evaluation.

'Area 1' and 'Area 2' are a series of catchment basins occurring in the western part of the Permit. This general area should be checked for the presence of springs and possible sulphur deposits.

'Area 3' and 'Area 4' should also be examined on the ground for possible springs of spring deposits. Sampling of the lake bottoms is recommended, and any samples having a sulphurous odour should be analyzed.

CONCLUSIONS AND RECOMMENDATIONS

From our overall sulphur studies in the general area, we conclude that the most likely sources of commercial sulphur are surficial deposits.

We also conclude, from our regional studies of the sulphur prospects of the subject area, that surficial deposits of sulphur are likely to occur in muskegs, lakes, or abandoned lacustrine depressions, with particular reference to such areas that are along or adjacent to fractures and/or faults responsible for sulphate water springs.

We have determined that a number of such features show well on the air photographs and these areas have been outlined on the accompanying photogeological mosaic, Figure 2.

In view of the above, it is recommended that a field check be made of the localities that have been indicated by the photogeological study to be prospective. This field check would be that indicated as Step 1 of Phase II in our letter of June 18, 1968.

This report has been prepared for the exclusive use of Stampede Oils Ltd., and is not to be reproduced in whole or in part in any form without the written permission of J.C. Sproule and Associates Ltd.

[redacted]

V.A. Farley

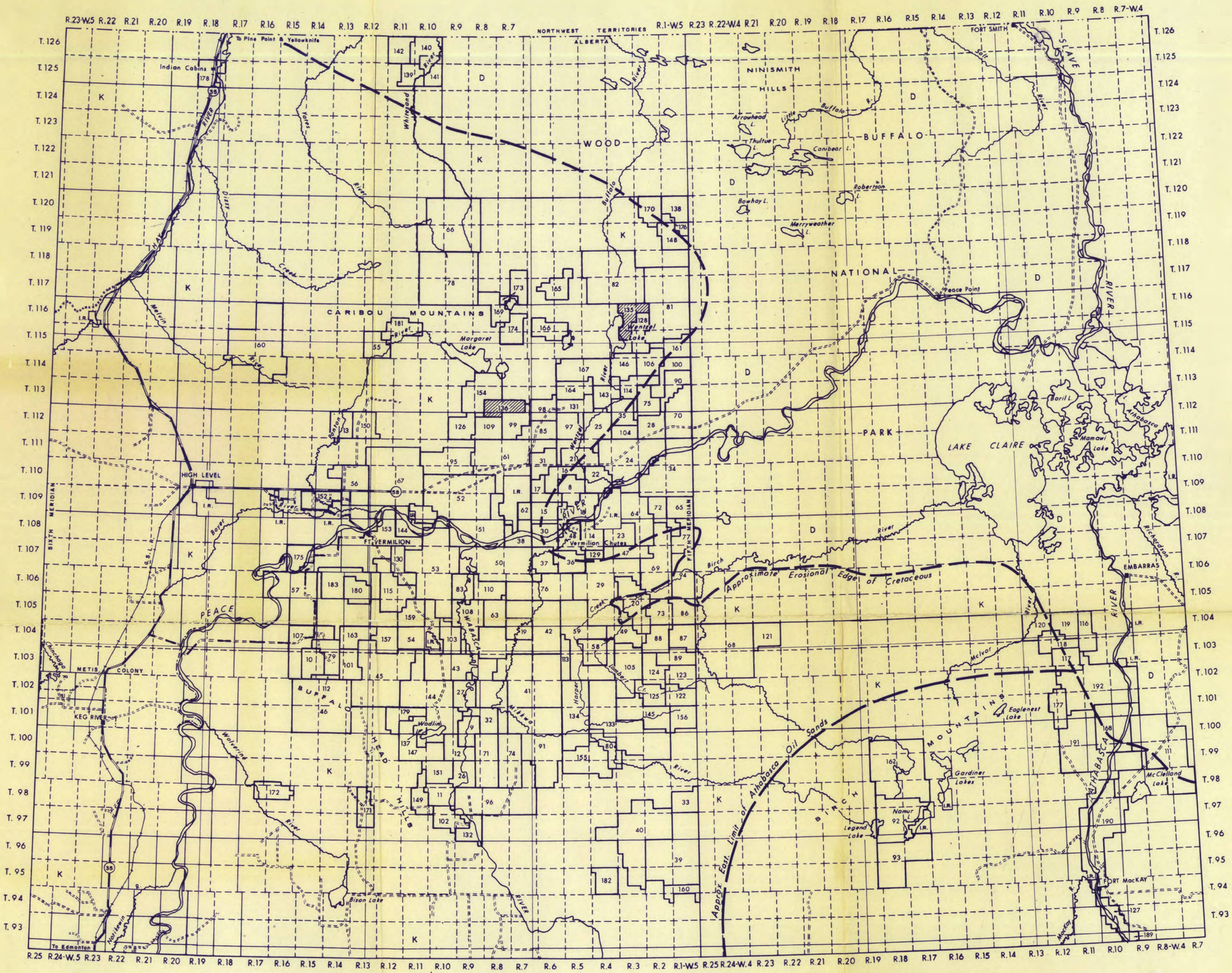
[redacted]

S.R.L. Harding, P. Geol.

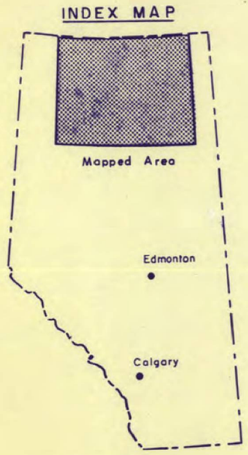
1009 Fourth Avenue S.W.,
Calgary 2, Alberta.
July 31, 1968.
VAF:SRLH:ldl

To acompany Report to Stampede Oils Ltd., July 1968

FIGURE - 1



INDEX MAP



LEGEND

- K — Cretaceous Formations
- D — Devonian Formations
- 138 — Sulphur Prospecting Permits
- Subject Permits
- Highway - Gravelled
- All Weather Road - Gravelled
- Dry Weather Road - Dirt - Truck Trail

NORTH - CENTRAL ALBERTA

SHOWING

SULPHUR PROSPECTING PERMITS

16 0 16 32

SCALE: 1" to 16 MILES

PREPARED FOR

STAMPEDE OILS LTD.

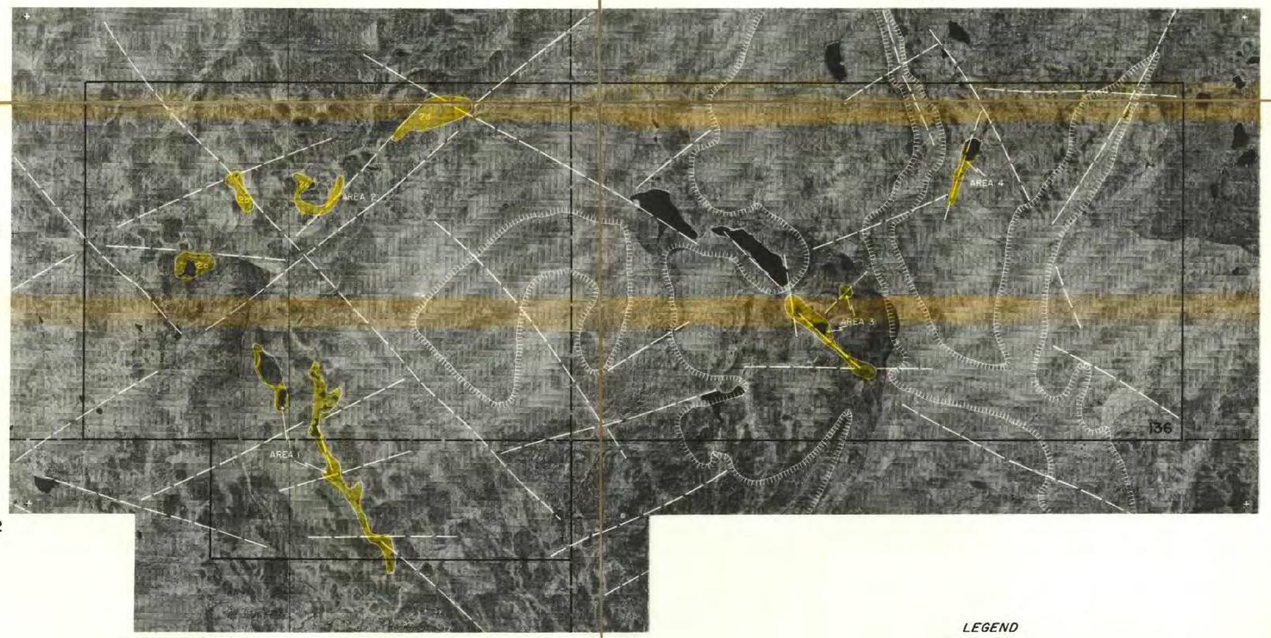
NOTE: Permits as Published to: March 29, 1968 (Data on later permits not yet available)

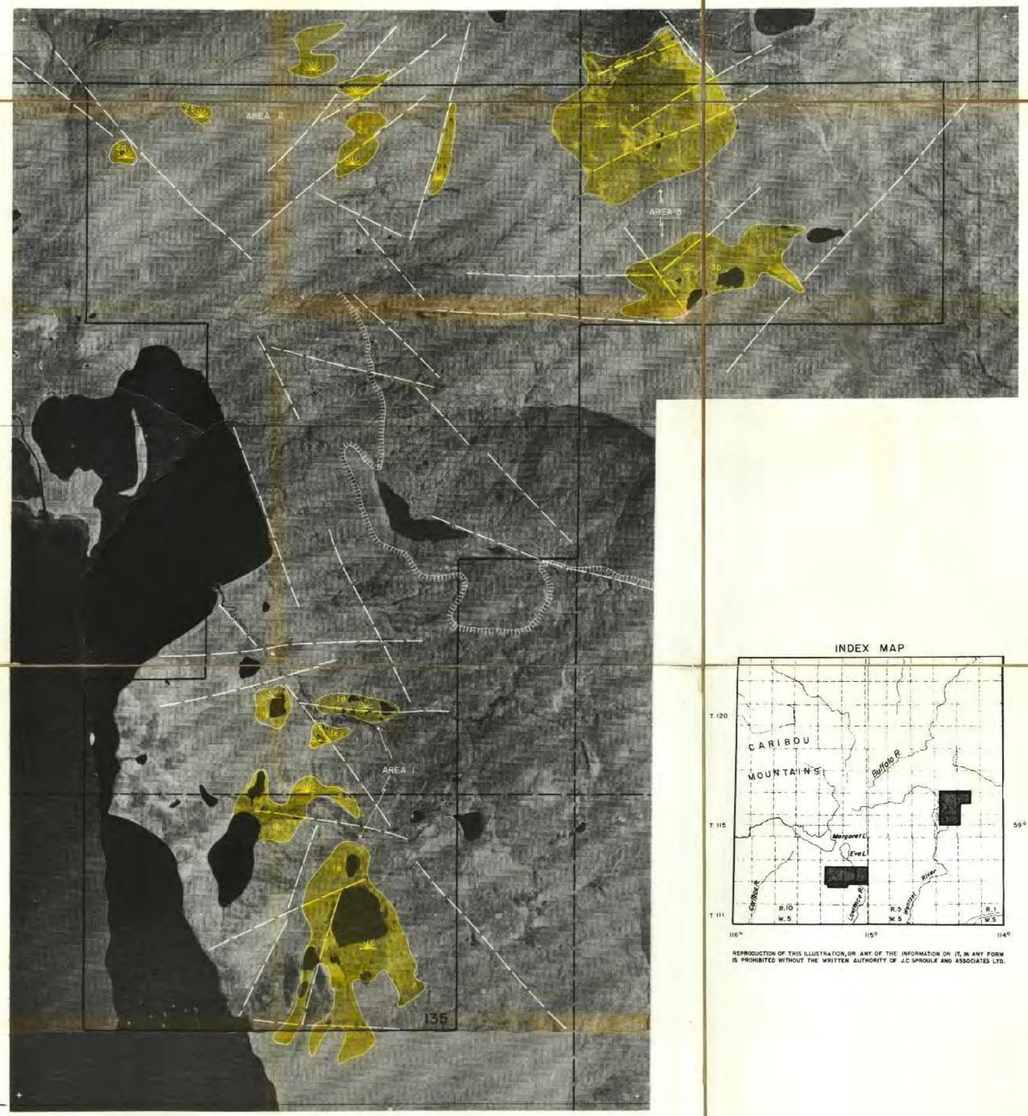
J.C. SPROULE AND ASSOCIATES LTD., CALGARY

19680117

FIGURE - 1

To accompany Report to Stampede Oils Ltd., July 1968





LEGEND

SURFICIAL DEPOSITS

Muskeg

PHOTOGEOLOGICAL SYMBOLS

Scarp

Alignment interpreted to indicate faulting or fracturing in bedrock

AREA 1, 2 etc. Areas of interest discussed in report

135, 136 Sulphur prospecting permit outline

INDEX MAP

PHOTOGEOLOGICAL MOSAIC
SULPHUR PROSPECTING PERMIT
Nos. 135, 136

FORT VERMILION AREA
ALBERTA

PREPARED FOR
STAMPEDE OILS LTD.

Mi. ½ 0 1 2 3 Mi.

APPROXIMATE SCALE IN MILES

THIS IS A SEMICONTROLLED MAP-MOSAIC AND SHOULD NOT BE MISTAKEN FOR AN ACCURATE GEOGRAPHIC BASE

J.C. SPROULE AND ASSOCIATES LTD. CALGARY, ALBERTA

JULY 1968

19680117

FIGURE 2