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FILE REPORT No.
<u>S-AF-094 (1)</u>

PRELIMINARY GEOLOGICAL REPORT
SULPHUR PROSPECTING PERMIT NO. 94
NORTHERN ALBERTA

Prepared For
Alaska Canadian Corporation
January, 1968

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

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PRELIMINARY GEOLOGICAL REPORT
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NORTHERN ALBERTA

INTRODUCTION

This report has been prepared at the request of Mr. P.A. Schwerdt, acting for Alaska Canadian Corporation, hereinafter referred to as the "Company."

Sulphur occurrences have been reported from many points in northern Alberta and the adjacent Northwest Territories over a period of at least a century. Such sulphur shows have taken various forms including small deposits around springs and gas seeps (also "smoke" and "steam" escapes), thin stringers, beds and cavity infillings in various types of strata. Finely disseminated sulphur is also present as an appreciable minor constituent in many shale deposits and in the well-known Athabasca Oil Sands. Until recently, it had been assumed that such sulphur deposits were uneconomic. The current world-wide shortage of this mineral, however, plus the vastly increased sulphur prices over the last decade, has helped to change the Industry's attitude toward such deposits. It is also pertinent that Industry, in general, had not previously known of the existence of these deposits.

Under the present conditions, the earlier scattered reports of sulphur shows in northern Alberta have suddenly become significant. During recent months, mainly as the result of a show of sulphur encountered on what is now Sulphur Prospecting Permit No. 8, many Sulphur Prospecting Permits have been issued to a number of persons and companies and many other Permit applications are presently being processed by the Alberta authorities. Several major oil and chemical companies have taken up Sulphur Prospecting Permits in the play and others are rumoured to be making deals with smaller companies, or individuals, now holding Permits.

This report presents the results of an investigation of publicly available information relating to the Company's Sulphur Prospecting Permit No. 94 and surrounding areas. Areas adjacent to Sulphur Prospecting Permit No. 94 were included in a regional helicopter reconnaissance carried out by geologists of J.C. Sproule and Associates Ltd.

DESCRIPTION OF PROPERTY

The holdings under consideration, as presented to us, are as follows:

<u>Permit No.</u>	<u>Location</u>	<u>Total Acreage</u>
94	Townships 106 and 107, Range 1, W. 5 M.	33,280

The above Permit is 100 percent owned by the Company and is subject only to normal Government Royalty.

Although the information on this property, as given to us by the Company, has been accepted as correct, we have made no investigation of our own as to the legal title of the interests held.

LOCATION, ACCESS AND TOPOGRAPHY

The Permit is in the general Fort Vermilion region. The town of Fort Vermilion is located approximately 350 miles north-northwest of Edmonton and is about 45 miles by road east of the town of High Level, which is served by both the Mackenzie Highway and the Great Slave Lake Railway. The location and outline of the Company Permit is shown on the accompanying map, Figure 1.

Sulphur Prospecting Permit No. 94 is located on the south side of the Peace River approximately 70 miles east-southeast of Fort Vermilion. The nearest all-weather road is Highway No. 58, which is 24 miles to the northwest and across the Peace River.

Locally, Sulphur Prospecting Permit No. 94 is in low relatively flat terrain with a large percentage of muskeg, scattered black spruce, etc. Harper Creek passes from west to east through the central portion of the Permit. This Permit will justify close examination in the field because of the prevalence and considerable variety of muskeg and closed or almost closed water bodies.

MODE OF OCCURRENCE OF SULPHUR IN RELATIONSHIP TO GENERAL GEOLOGY

Within the general area of interest the principal outcropping bedrock is of Cretaceous age, but, in the northeast portion, particularly in the valleys of the Peace River and Mikkwa River, erosion has stripped off the Cretaceous beds, exposing the older Devonian. The Devonian, as well as the overlying Cretaceous rocks, are generally inclined gently westward into the Alberta syncline so that progressively younger rocks of both Paleozoic and Mesozoic ages are at the surface in that direction. Surface outcrops of both Paleozoic and Cretaceous ages are widespread but not numerous. Very little has been published on them, doubtless because they have not previously appeared to have economic significance.

The bedrock, whether of Devonian or Cretaceous age, is overlain by a variable thickness of glacial and related sediments. The thickness of the glacial beds varies from zero to several hundred feet. The thickness is naturally least in those areas where river valleys are deeply incised.

It is, at this time, not clear to what extent the sulphur is developed in superficial deposits and to what extent it is present with the stratified deposits of the Cretaceous and/or Devonian, but it is believed that both types of occurrence may exist.

The known deposit on Sulphur Prospecting Permit No. 8, about 25 miles to the northwest, appears to be mainly superficial, in the form of lacustrine sediments. It is reported that several pits have been dug and approximately 160 shallow power-auger holes have been drilled, defining a sulphur body measuring 1,400 feet by 1,400 feet. The full thickness and outline of this deposit has yet to be determined. Samples from one of the pits were collected in the field by J.W. Bakhoven, P. Geol. of J.C. Sproule and Associates Ltd. Sulphur assays of these samples range between 62 percent to 70 percent.

At the present time, Bow Valley Industries, the Operator of Sulphur Prospecting Permit No. 8, is undertaking an evaluation of this deposit, but the information from such investigations is confidential.

Sulphur Prospecting Permit No. 94 has not been examined in the field but reconnaissance work carried out by geologists of J.C. Sproule and Associates Ltd. in adjoining areas to the north and west is described as follows.

Carbonate rocks outcrop along and adjacent to the major streams. Sulphur springs are common, especially to the west and northwest of the subject Permit. Sulphur encrustations are also prominent along Harper and Lambert creeks.

In the above comments on mode of occurrence, we have avoided discussion of theories of origin 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 origin and manner of occurrence of sulphur deposits are of prime importance since these factors will determine whether or not sulphur can be mined at the surface or by stripping, or must be taken from deeper strata by the Frasch process.

SUMMARY AND CONCLUSIONS

Alaska Canadian Corporation has acquired Sulphur Prospecting Permit No. 94. This Permit totals 33,280 acres and is 100 percent Company owned, subject only to normal Crown Royalty.

The Permit is in an area where active interest has been shown by a number of companies, including large sulphur producers and users.

The initial discovery of sulphur in the Fort Vermilion area was made on Sulphur Prospecting Permit No. 8. The occurrence of sulphur in this Permit has been confirmed by senior geologists of J.C. Sproule and Associates Ltd.

The origin, or origins, of the sulphur occurrences in the general Fort Vermilion area is not known at this time. On the basis of our general knowledge of sulphur occurrence and our specific knowledge of the area, we believe, however, that the best prospects are in areas where Devonian beds are at or near the surface. From this point of view, Sulphur Prospecting Permit No. 94 is particularly favourably located.

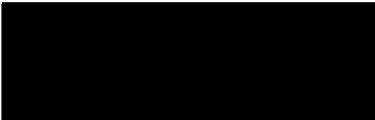
Sulphur Prospecting Permit No. 94 is not readily accessible as it is south of the Peace River and about 28 miles from Highway No. 58. From the standpoint of local terrain, Sulphur Prospecting Permit No. 94 is both relatively poorly drained with substantial percentages of muskeg and fair prospects for certain types of sulphur occurrence.

It is recommended that a detailed photogeological study of the Permit and adjacent areas be undertaken. Every effort should be made to acquire and analyze pertinent information on sulphur occurrences in Alberta. Subsurface data, including logs and samples from wells in the vicinity of the Permit, should be studied. The cost of the preliminary work should be a maximum of \$600.

These photogeological and related preliminary studies will provide a useful background for the field geological studies that should cost a maximum of \$3,500. Such work would include the field operations of a geological party operating on and around the Permit concerned during the summer field season. The field operations would involve a ground check of the observations made during the photogeological study as well as of rock outcrops and related geological indications. A certain amount of surface and auger test sampling would also be involved. The party concerned would move into the area by truck and conduct work within the area by helicopter and ground traverse.

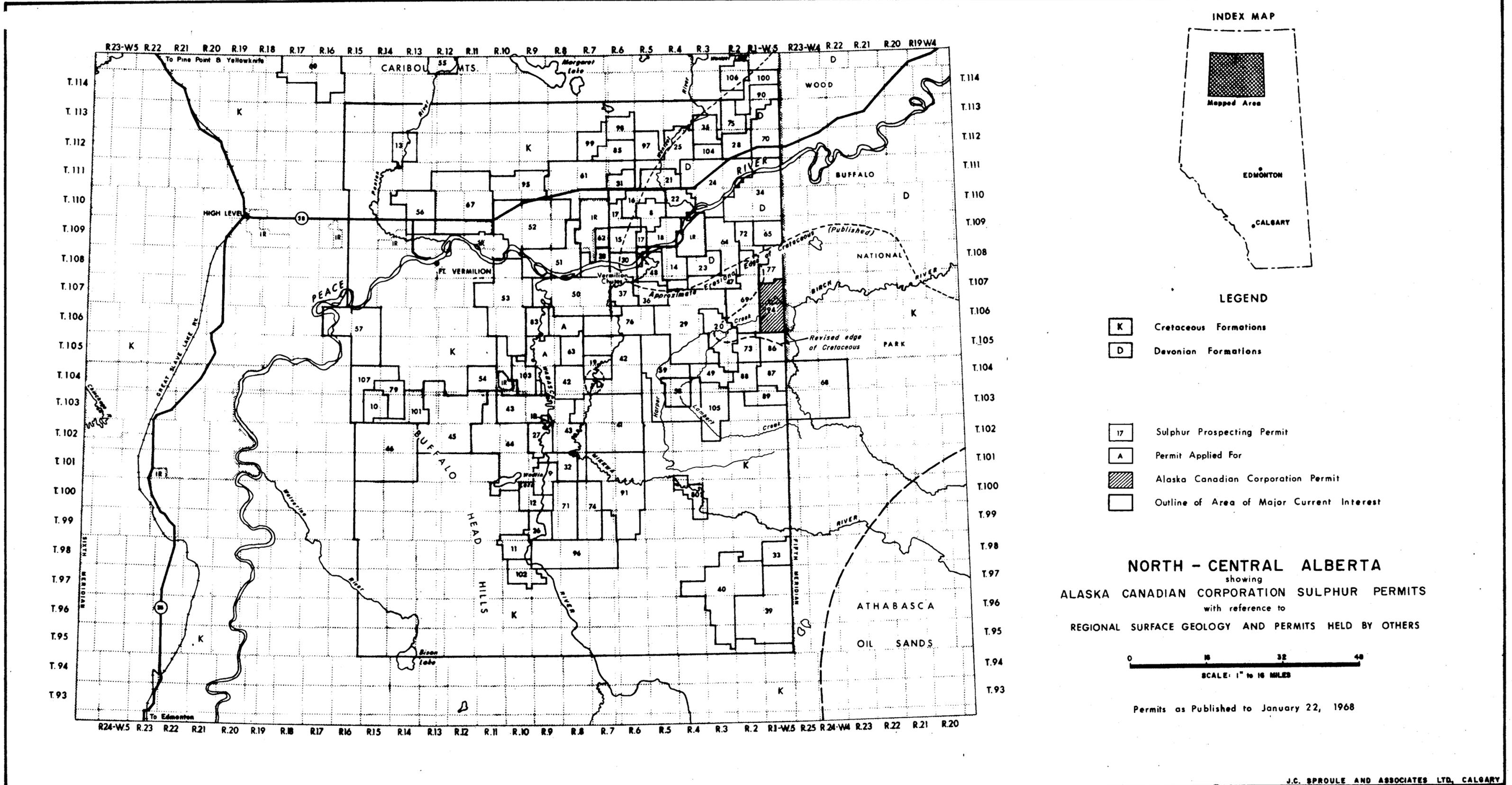
Assuming further work is then justified on a basis of the geological operations described above, it is estimated that a field drilling program, using a portable drill, would cost approximately \$6,000 for Sulphur Prospecting Permit No. 94.

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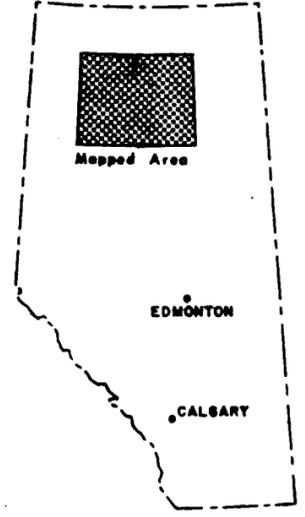

V.A. Farley *J*


J.C. Sproule, P. Geol. *J*

1009 Fourth Avenue S.W.,
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January 26, 1968.
JCS:VAF:ldl



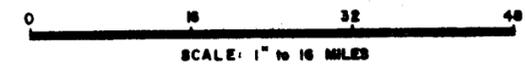
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NORTH - CENTRAL ALBERTA
 showing
ALASKA CANADIAN CORPORATION SULPHUR PERMITS
 with reference to
REGIONAL SURFACE GEOLOGY AND PERMITS HELD BY OTHERS



Permits as Published to January 22, 1968