







REPORT ON SURFACE GEOLOGY

BOVIE LAKE AREA

Conducted by

C. O. Grasdal

PAN AMERICAN PETROLEUM CORPORATION

on

NORTHWEST TERRITORIES PERMITS

No. 1144

No. 1145

Abstracted for  
Geo-Science Data Index

Date \_\_\_\_\_

Map in Separate Folder

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During the period September 11 to September 25, 1958.

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Map in Separate Folder

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ENCLOSURES

#1      Surface Geological Map 1" = 8000' In Separate Folder

GEOLOGICAL REPORT FID-44

BOVIE LAKE AREA

INTRODUCTION

During the period September 11 to September 25, 1958, surface geological mapping was carried out in the Bovie Lake - Bekami Lake area of the Northwest Territories and Northeast British Columbia.

Assistance was given in the field by A. E. Wootton, J. F. S. Anderson (one week) and H. S. Stevens (one week). A Bell, Model 47-J, helicopter, contracted from Spartan Air Services, Ottawa, Ontario, was used for transportation and aerial reconnaissance. A Pan American-owned Beaver aircraft was stationed in Fort Nelson, British Columbia, and was used in supplying the camp. Daily communication to Fort Nelson was by means of a 50-watt two-way radio.

The main weather condition hampering the operations was low ground fog which persisted until noon or almost every day.

TOPOGRAPHY AND OUTCROPS

The area lies well out in front of the mountains proper. The area is generally flat to rolling with relief up to 500 feet; the exception to this is the Bovie Lake ridge which has a maximum relief of 1,000 feet and stands out as a prominent cliff. Widespread muskeg, numerous lakes, heavy vegetation and northeast-southwest trending glacial lineations are characteristic.

Outcrop density is very poor to the east of the Bovie Lake structure, and no outcrop was located between the Petitot and Muskeg Rivers in the Celibeta Lakes vicinity.

STRATIGRAPHY

Following is a brief summary of the surface stratigraphy occurring in the Bovis Lake - Bekami Lake Area. For a more complete discussion, reference is made to Geological Report FXD-18, 1956, by S. A. Antoniuk. A general stratigraphic discussion may be seen in Geological Survey of Canada Memoir 259 (McLearn, F. H. and Kindle, E. D.)

Table of Formations

<u>Period or Epoch</u>	<u>Formation or Group</u>	<u>Approximate Thickness</u>	<u>Lithology</u>
Pleistocene or Recent			Till and Fluvioglacial material
Upper Cretaceous	Kotaneelee	500'±	Marine shales with occasional sandstone and grit beds
	Fort Nelson or Dunvegan	500'-750'	Conglomerate to coarse grained cross bedded sandstone.
Lower Cretaceous	{ Lepine	1700'±	Shale; dark grey marine.
	{ Scatter	500'±	Sandstone; grey-green fine grained with black shale; poor porosity.
	{ Buckinghorse	1500'±	Shale; dark grey marine.
Carboniferous	Sandstone Member	350'+	Sandstone, quartzose, fine-medium grained good porosity.
Mississippian	Rundle	270' ex- posed est. up to 1700'	Limestone; coarse crystalline, organic to dense, fine grained.

The following is based on limited subsurface control:-

<u>Period or Epoch</u>	<u>Formation or Group</u>	<u>Approximate Thickness</u>	<u>Lithology</u>
	Banff	1400'	Shale; dark grey with silty to sandy bands.
Upper Devonian	Fort Creek	3400'	Shale; grey, calcareous with limestone and siltstone beds.
Middle Devonian	Slave Point	500'±	Limestone, fine grained dense, could become reefoid.
	Elk Point	900'±	Limestone, fine grained dense. Dolomite; coarse crystalline, reefoid good porosity, thickness variable.

RESERVOIR BEDS

The most important reservoir bed is found in the Elk Point Group of the Middle Devonian. At Imperial Island River #1 (60°09'29" N.Lat., 121°08'16" W.Long.) 140 feet of porous, reefoid dolomite was encountered in the basal part. At Bluefish Lake (61°11' N. Lat., 123°22' W.Long.) the Ramparts formation consists of 600 feet of porous, coarse crystalline reefoid dolomite. Middle Devonian reefs, including the Slave Point formation, yield gas in commercial quantities in the Fort Nelson area.

Reservoir beds may be present in the Carboniferous sand and Mississippian limestone. However, because these units outcrop in the area, and would be near surface generally, they cannot be considered important reservoir beds.

STRUCTURAL GEOLOGY

Bovie Lake Anticline

This is a north-south trending anticline, crossing the 60th parallel at  $122^{\circ}57'$  west longitude and extending from the Muskeg River to about  $59^{\circ}52'$  north latitude, a distance of 30 miles. The feature stands out as a cliff forming ridge of Mississippian limestone with a good west limb showing an almost complete section, on the Petitot River, from the top of the Mississippian to the Cretaceous Kotaneelee formation. The east limb is apparent south of the Petitot River where east dipping Mississippian limestone occurs. The south plunge is evident at  $59^{\circ}52'$  north latitude where the Mississippian limestone is rimmed by the Carboniferous sandstone on the east, south and west sides of the feature. Northeast dipping Carboniferous sandstone is exposed at the north end of the structure; the contact with the underlying Mississippian can be traced around to the west limb indicating north plunge at this point. Questionable east dips occur in the Mississippian limestone exposures southeast of the N.F.A. Bovie Lake #1 wellsite ( $60^{\circ}02'11''$  N.Lat.,  $122^{\circ}58'18''$  W.Long.).

The feature was originally interpreted as an anticline with an exaggerated west limb due to two separate ages of folding or basement control, or perhaps a combination of both. The current interpretation favours the same tectonic action as being responsible for the structure. West dips up to  $70^{\circ}$  on the Petitot River and a west dip of  $60^{\circ}$  in the Carboniferous sand at the N.F.A. Bovie Lake #1 wellsite suggest that the west limb is somewhat exaggerated even though east dips up to  $40^{\circ}$  occur in the Mississippian limestone south of the Petitot River.

South plunge on the feature is approximately 200 feet per mile. North plunge on the anticline is approximately 300 feet per mile.

Celibeta Lakes Structure

The Celibeta Lakes feature is a Mississippian surface high probably comparable to the Fort Nelson structural high to the south.

The Mississippian outcrops on the Petitot River at  $122^{\circ}20'$  west longitude with an attitude indicated by plane table surveying, of north  $70^{\circ}$  east, dipping  $2^{\circ}$  southeast. North, on the Muskeg River (also surveyed) the Scatter formation strikes north  $59^{\circ}$  east, and dips  $1/2^{\circ}$  to the northwest. Attitudes on the Scatter formation and Mississippian limestone on the Muskeg and Petitot Rivers respectively are believed to represent the north and south plunge of a large structural feature existing mostly in the Northwest Territories.

No outcrop was found between the Petitot and Muskeg Rivers east of the Bovie Lake feature. However, higher relief in the Celibeta Lakes area could represent topography controlled by Mississippian structure.

Respectfully submitted,

PAN AMERICAN PETROLEUM CORPORATION

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COG:po

Edmonton, Alberta  
November 19, 1958