





WESTERN DECALTA PETROLEUM LIMITED  
PHOTO GEOLOGICAL STUDY OF  
N.W.T. PERMITS: 5312, 5313 & 5314  
BY GEOPHOTO

D.I.A.N.D. PROJECT NO. 19-2-4-69-2

## MEMORANDUM REPORT



### INTRODUCTION

This study was undertaken by Geophoto Services, Ltd. for Intercontinental Oil Company to map the surface structure in Permits 5312, 5313, 5314, with special emphasis on the south portion of Mattson Anticline.

As an additional aid to a more complete structural evaluation, three topographic profiles were constructed with annotated significant geologic information.

### PHOTOGRAPHY

A total of 23 aerial photographs were used to map the Mattson Anticline area. The photography was taken for the Canadian Government in 1961 by Bradley using a 6 inch focal length camera. The photography was flown east-west at a scale of 1:50,000.

The photography and the ER-55 diapositives are of very high quality.

### METHOD OF MAP COMPILATION

The first phase of this investigation was a photogeologic study to determine what beds could best be used to accurately delineate the structure. It was decided that the top of the Mattson Formation was the only marker that could be carried throughout the project area, even though it represents an erosional surface.

After completing the photogeology, diapositives of the 1:50,000 photography were set-up in the Balplex (ER-55) stereoplotter. Advance copies of the "Mount Flett" topographic map, scale, 1:40,000; contour interval, 50 ft., were



used as the primary control for both horizontal and vertical; controlling the east-half of the project area. The flights were bridged westward using the Army Survey Est. R.C.E. "La Biche River" topographic map, scale, 1:25,000; contour interval, 500 ft., as secondary control to the west.

The area was mapped at a scale of 1:10,000. Elevations were read on key-beds, dips and strikes were measured, and unit thicknesses were determined. Planimetric features were also mapped at this time. A preliminary interpretation was made on the original manuscripts while the flight was in the plotter. The topographic profiles were traced at this time.

Upon completion of the stereoplotter work, the manuscripts were photographically reduced to a scale of 1:31,680. The final interpretation was then made.

Using the "Mount Flett" source map for final positioning and the geographic graticule, the base map was then drafted at the scale of 1:31,680 using the planimetric information derived from the stereoplotter mapping. A geologic overlay was then constructed over the base map. The actual structure contours were redrafted on the overlay with a contour interval of 500 feet.

## STRATIGRAPHY

### Devonian-Mississippian

Dark shales with hard beds form the valley floor of the interior of the northern anticline. The total thickness of this unit is reported to be approximately 5300 feet.



### Mississippian

This unit is comprised of thinly bedded sandstone, fine-medium grained with minor interbedded siltstone and black shale. These grade upwards into non-calcareous black shales with thin limestone beds.

Capping the Mississippian is a medium-to thickly-bedded, medium-to coarse-grained, grey, crinoidal and fossiliferous limestone interbedded with thin-to medium-bedded, fine-grained, dark grey argillaceous, bioclastic limestone, dark grey, calcareous shale, and thin beds of fine-grained, grey calcareous sandstone and fine-grained dolomite. The aggregate thickness of the Mississippian is reported to be 3070 feet.

### Pennsylvanian - Permian

The Mattson Formation can be subdivided into three members. The lowest is fine-grained, light-grey sandstones, mainly thinly-bedded and in part carbonaceous. This unit is generally partly recessive. The middle member is mainly fine-to medium-grained, in part coarse-grained to finely conglomeratic, light-grey to light-brown sandstones, medium-to massive-bedded and usually crossbedded. The unit is more resistant and cliff-forming than the upper and lower members. The upper member includes fine-grained, light-grey medium-bedded, calcareous sandstones, and minor black, fissile, concretionary shales. The overall thickness of the three units, as measured on the west flank of Mattson anticline, is 4900 feet. Only 3140 feet of the Mattson crops out on the east flank of the anticline below the sub-Cretaceous erosional unconformity.

### Lower Cretaceous

Overlying the Mattson Formation unconformably is an undetermined thickness of rubbly, micaceous, concretionary shales with many thin beds of bentonite.



## STRUCTURE

The predominant structural feature within the project area is an arcuate anticlinal fold plunging south-southwest in the northern portion and north-northwest in the southern portion of the project area. The structural highs of both anticlines are outside the area of investigation.

The anticline is asymmetric with the steeper west flank having an average dip of 40 degrees. The east flank has an average dip of about 30 degrees. The structure has a major reverse fault sub-parallel to the axis, the west side being the upthrown side. In the vicinity of the structural saddle, the west side of the fault is thrust over the axis of the anticline. The fault exhibits at least 5000 feet of vertical displacement in the center of the area, probably dying out in the Mississippian-Devonian shales to the north. The location and displacement of the fault where it strikes into the soft shales exposed in the breached interior of the northern anticline is questionable.

In the approximate center of the project area lies a small thrust block. It is believed that this block is very shallow and the very complex structure observed within the block does not bear any resemblance to the structure below, thus no attempt was made to interpret these local structural features.

The only horizon recognizable over the entire project area is the base of the Cretaceous which rests unconformably on the Mattson Formation. On the east side of the axial reverse fault, the interval measured between the base of the Cretaceous and the top of the Mississippian limestone is 1760 feet less than on the west side, and this difference has been added in adjusting lower horizon elevations to datum. Beyond this, it was not possible to take into account the irregularities of the erosional surface that undoubtedly exist.



Structural control within the breached interior of the northern anticline is virtually nonexistent. It was possible only to measure a few sparse dips which enabled formline interpretation to be made over the central part of the anticline.

Respectfully submitted,  
GEOPHOTO SERVICES, LTD.

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