MAR 19800005: POINTE BASSE

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CANADIAN MINING GEOPHYSICS LTD.

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19800005

REPORT ON ICE GRAVITY SURVEY

FOR

HUDSON'S BAY OIL & GAS CO. LTD.

POINTE BASSE 6879030003

Work Performed March 17-April 6, 1980

April 24, 1980

D.P. Olson,P.Eng.,P.Geoph.

LIST OF ILLUSTRATIONS *

TABLE OF CONTENTS

* For the sake of brevity, the prefix "8023-" has been omitted from all references to the plates within the text of the report.

CANADIAN MINING GEOPHYSICS LTD.

HUDSON'S BAY OIL & GAS CO. LTD.

ICE GRAVITY SURVEY

POINTE BASSE 6879030003

SUMMARY

An ice gravity survey on Lake Athabasca was executed during March and April, 1980 over the Pointe Basse lake grid in Northern Alberta by Canadian Mining Geophysics Ltd., on behalf of Hudson's Bay Oil & Gas Co. Ltd.

The object of the survey was to locate faults which may pass through the grid. In order to read gravity on the ice, it was decided to use a heavily damped Lacoste and Romberg HG meter using variable averaging on windier days. The instrument and technique which was used to transport the meter worked well. During the course of the survey, 483 gravity observations were made, of which 35 were taken on lines extended on land to the north.

One definite contact was located and is indicated by trace A on Plate 2. A second feature, which may be either

a fault/contact or a small intrusive/rock change is indicated by trace B on plate 2.

It has been recommended that all of the survey lines be extended onto land to fully define trace A, which appears to be the major contact in the grid so far.

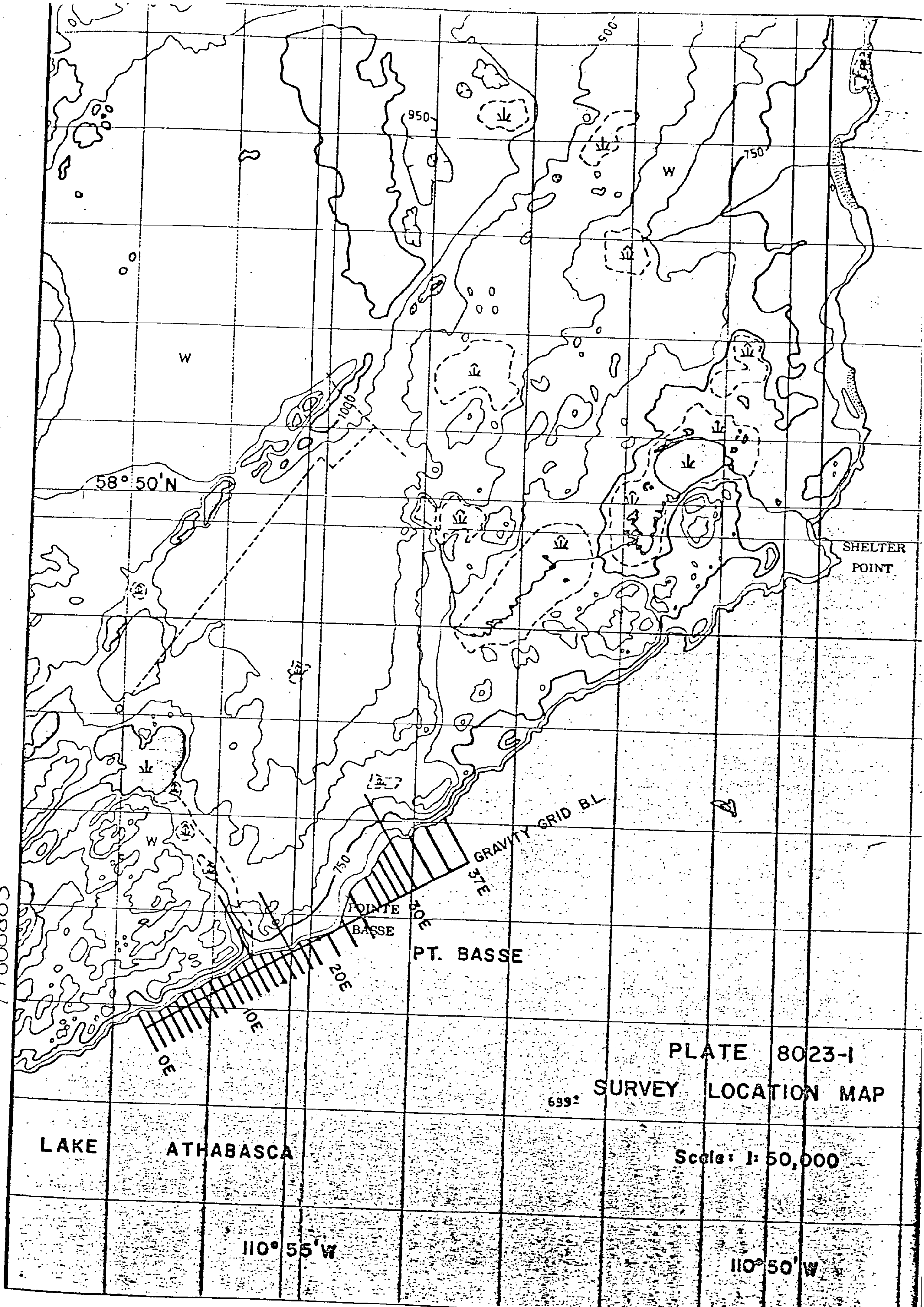
LOCATION AND ACCESS

Pointe Basse is located approximately 6 miles east of the town of Fort Chipewyan at the west end of Lake Athabasca in northern Alberta (Fig. 1). The survey crew stayed in the town of Fort Chipewyan and commuted by truck over the Dorey Lake road and an ice road along the north shore of Lake Athabasca to the Pointe Basse ice grid.

GENERAL

The gravity survey took place on the grid which was established for an I.P. and magnetometer survey by CMG and ran concurrently with the other surveys. Three lines (13+00E, 17+00E and 31+00E) were extended approximately 600m onto land in order to obtain background readings in this area. These extensions are cut and picketed and are marked with orange flagging.

All wooden pickets on the ice were removed at the end of the surveys according to the Alberta Land Use Permit Regulations.


950
900
750
W
1000
58° 50'N
SHELTER
POINT
GRAVITY GRID B.L.
750
37E
30E
POINTE
BASSE
20E
PT. BASSE
10E
0E
PLATE 8023-1
SURVEY LOCATION MAP
699±
LAKE ATHABASCA
Scale: 1:50,000
110° 55'W
110° 50'W

19800005

EQUIPMENT

The level survey used a Zeiss Model 2-050C auto level and a metric stadia rod. Closures were maintained to within ± 5cm.

The gravity survey used a Lacoste and Romberg remote-controlled, heavily damped meter #HG-16. This meter has auto levelling with servo motors to maintain level within 20 seconds. The meter's output is an indication of the gravitational field strength using the same dial readout as a regular G meter. However, the operator is guided by a chart recorder pen which must be positioned (by varying the dial reading) to register a straight line paralleling the sides of the chart paper. To aid in this operation on noisy days, three different levels of averaging can be switched in to the output circuit. This inserts a variable time-constant in the output, thus decreasing the response time of the system, but allowing readings to be taken under extremely noisy conditions.

The HG-16 meter was mounted in a specially built, heated "dog house", which was towed from station to station (50m separation) behind a dual-track Alpine snowmobile. An electrical generator kept the two 12-Volt batteries charged during use. A small propane heater was installed to maintain above freezing temperatures within the "dog house".

Readings on land were taken with a regular G meter (G-52) from Lacoste and Romberg. Corrections were applied to put the G-52 readings on par with the observations made with HG-16.

CORRECTIONS

Included as Appendix A are the data sheets showing the reduction of the observed field data to Bouguer gravity. The raw field data is in columns 1 to 4. Tide corrections were obtained from the Geologic Survey of Canada in Ottawa for Fort Chipewyan. These were not applied to the data for two reasons: the amplitude of the tide corrections were insignificantly small compared to the anomalies discovered and closures were made to base stations often enough to assume that the tidal effect was removed through the regular meter drift corrections.

Latitude corrections were calculated assuming that a true East-West line of latitude where the correction was assumed to be zero passed through grid coordinates (0+00E, 3+50S). The grid baseline was at azinuth 062°, and the central portion of the grid is close to latitude 58°46'N. All latitude corrections were negative since all survey points were north of the zero reference line.

Column 8 on the data sheets shows the drifted observed gravity readings including the H.I. corrections, latitude correction and instrument drift correction (as well as tidal correction). The tidal correction table is included as Appendix B for reference. Columns 9 and 10 are the measured elevation and water depths respectively. Elevations were measured with respect to the "Basse Base Station", shown in Fig. 2. This base station was located approximately 32cm south of a boulder 100cm in diameter which was marked with several 2 inch wide red horizontal strips around the girth of the boulder. The location of the Basse Base is described as follows:

> "The Basse Base boulder lies at grid coordinates (13+41E, 2+10N), and at an assumed elevation of 213.56 meters ASL. The boulder is located 29.1 meters approximately grid south of a blazed pine tree bearing a nail approximately 16cm above ground level at an elevation of 214.94 meters ASL. A nail with flagging is located in the ground directly below the nail in the tree at an elevation of 214.78 meters ASL. The included angle at Basse Base between the blazed tree and the picket located at grid coordinates (13+00E, 2+25N) is 095°; the distance between Basse Base and (13+00E, 2+25N) is 43.5 meters. The acute angle at (13+00E, 2+25N) between Basse Base and grid line 13+00E is 070°".

The entire Point Basse ice grid can be reconstructed using the above information.

Column 15 of the data sheets is the final, reduced Bouguer gravity using a density of 2.35 gm/cc. This density was chosen because the grid lies over Athabasca sandstone. Very little change is observed in using a density of 2.65 on the lines extended onto land; the final interpretation is similar.

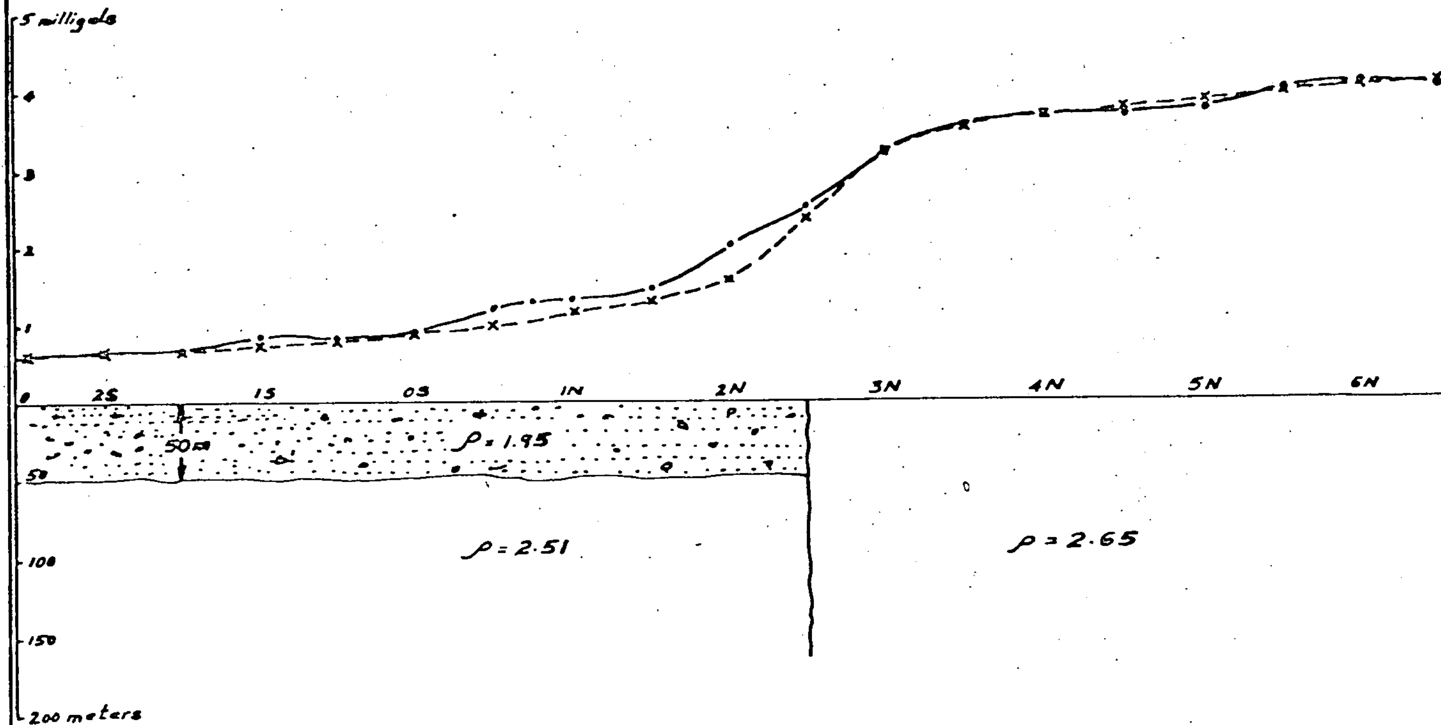
Water depth corrections were made by converting water of density 1.0 and depth as indicated in column 10 to sandstone of density 2.35 by the following formula:

Corr.for water(milligals) = 0.04191(1.35)(Water depth in meters)

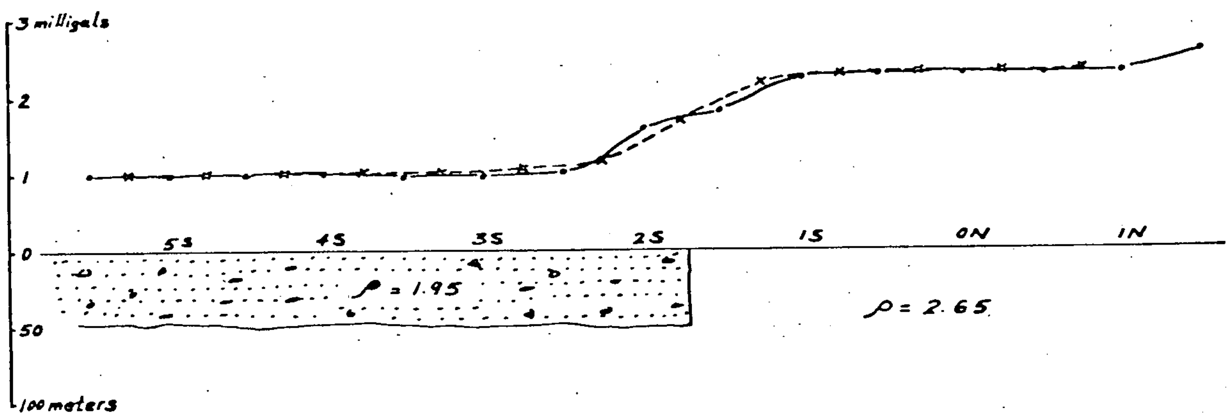
DISCUSSION OF RESULTS

Figure 2 shows the Bouguer gravity results plotted in stacked profile form, with a vertical scale of 1cm to 1 milligal. The trace of two faults or contacts are marked as A and B, the former located near the shoreline and having an amplitude of between 1.7 milligals at 13E and 2.9 milligals at 31E and the latter lying at 2S with an amplitude of 1.2 milligals. It can be seen that trace A has a reflection in the rising values at the north ends of most of the lines. It has been modelled to have two contributing causes: a contact between two granitic rocks with a density contrast of 0.14gm/cc (heavier unit to the north) and a 50 meter deep layer of sediments of density 1.95gm/cc out in Lake Athabasca. These results are shown in Fig. 4.

Trace B is a shorter feature extending from line 7E to 14E with a noticeable bend at 12E. It has been interpreted by modelling to be the northwestern boundary of a 50m deep layer of overburden with a density of 1.9gm/cc which extends out under Lake Athabasca. An alternative model is a



LINE 17+00 E



LINE 10+00 E

LEGEND

Overburden

Observed Bouguer gravity

Calculated profile over model shown

19800005

MODELLING RESULTS

PLATE 8023-4

slightly denser basement rock unit such as a basic dyke or sill which lies along the dashed line C in Fig. 3. This has not been modelled because the superposition of this feature on the western extension of trace A does not allow an easy pick of the background level. Hence, there are many models which would suit the field data.

CONCLUSIONS AND RECOMMENDATIONS

The usefulness of the heavily damped HG Lacoste and Romberg gravity meter on ice has been proven by many repeated readings which were taken during the course of this survey. Production rates averaging about 1km per day can be expected on 1 meter thick ice in winds up to 30 kph such as were encountered.

The survey successfully located at least two features which have been described as faults or geologic contacts. Their location is marked as traces A and B on Fig. 2.

It is recommended that the gravity survey be extended onto land on all lines except lines 13E, 17E and 31E in order to complete the tracing of the major contact/ fault A. This should be done on cut lines using a regular G-type meter. Closures in elevation of ±10cm and in gravity observations of ±0.05 milligals would be sufficient to complete the job.

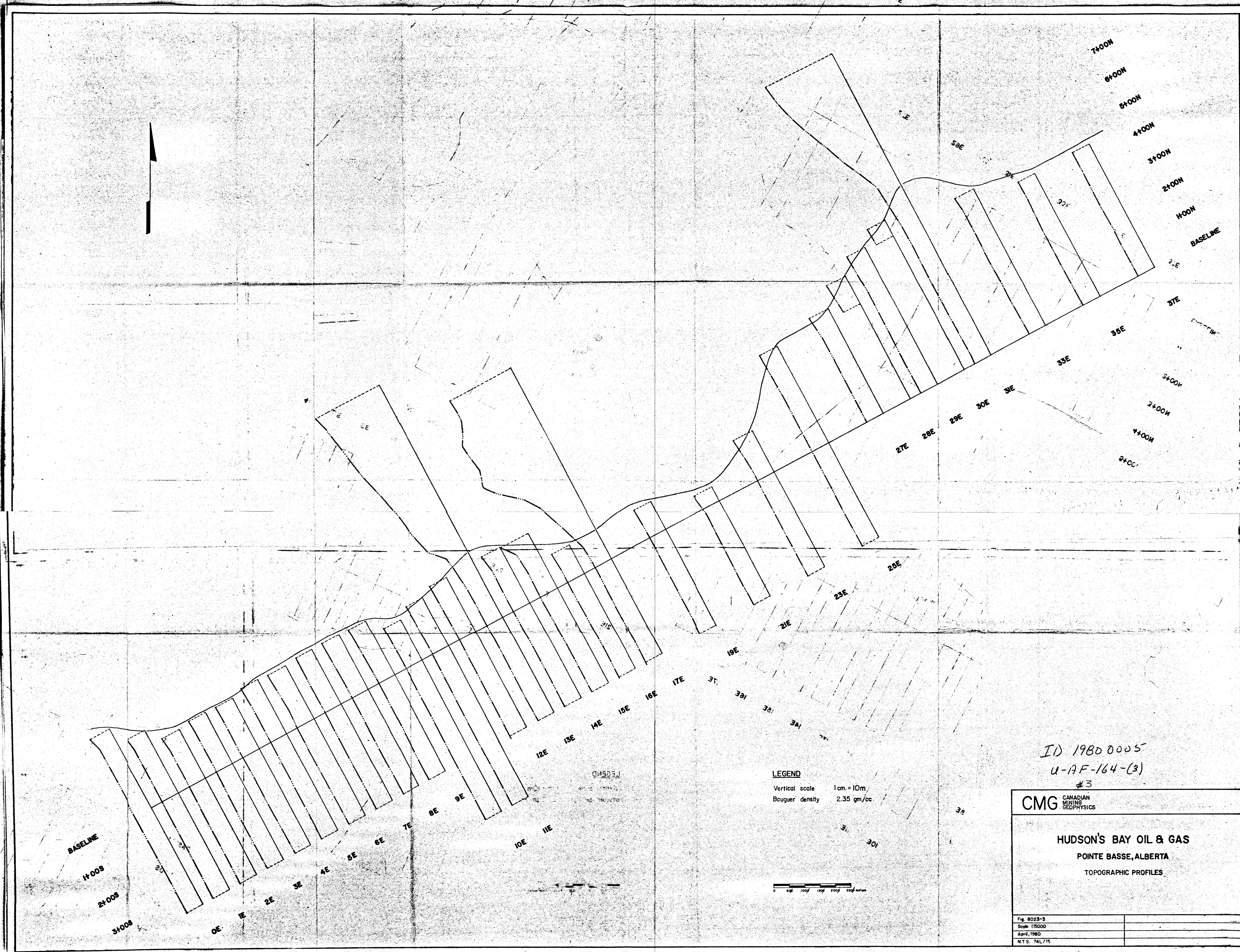
Respectfully submitted,

CANADIAN MINING GEOPHYSICS LTD.

REGISTERED PROFESSIONAL ENGINEER
D. P. OLSON
PROVINCE OF ONTARIO

D.P. Olson, P.Eng.,P.Geoph.,
Geophysicist.


BASELINE
1+00N
2+00N
3+00N
4+00N
5+00N
6+00N
7+00N
1+00S
2+00S
3+00S
0E
1E
2E
3E
4E
5E
6E
7E
8E
9E
10E
11E
12E
13E
14E
15E
16E
17E
19E
21E
23E
25E
27E
28E
29E
30E
31E
33E
35E
37E
A
A
B
C
LEGEND
Vertical scale 1 cm. = 1.0 milligal
Bouguer density 2.35 gm/cc
CMG CANADIAN MINING GEOPHYSICS
HUDSON'S BAY OIL & GAS
POINTE BASSE, ALBERTA
BOUGUER GRAVITY PROFILES
Fig. 8023-2
Scale 1:5000
April, 1980
N.T.S. 74L/15
ID 19800005
U-AF-164-(3)
#2



BASELINE
1+00S
2+00S
3+00S
0E
1E
2E
3E
4E
5E
6E
7E
8E
9E
10E
11E
12E
13E
14E
15E
16E
17E
19E
21E
23E
25E
27E
28E
29E
30E
31E
33E
35E
37E
7+00N
6+00N
5+00N
4+00N
3+00N
2+00N
1+00N
BASELINE
LEGEND
Vertical scale 1 cm. = 10 m
Bouguer density 2.35 gm/cc
ID 19800005
U-AF-164-(3)
#3
CMG CANADIAN MINING GEOPHYSICS
HUDSON'S BAY OIL & GAS
POINTE BASSE, ALBERTA
TOPOGRAPHIC PROFILES
Fig. 8023-3
Scale 1:5000
April, 1980
N.T.S. 74L/15

27