OIL & GAS OPERATIONS UNIT
Oil and Mineral Division
JAN 25 1971
OTTAWA, CANADA
Dept. of Indian Affairs & Northern Development

GEOPHYSICAL REPORT

TO

GOVERNMENT OF CANADA

ON

REFLECTION SEISMOGRAPH SURVEY

CAMERON RIVER PROJECT

SWEDE CREEK PROJECT

Shot For

Hudson's Bay Oil and Gas Company Limited

during winter of 1965 - 1966

By

Seismograph Service Corporation of Canada

On

C.P.&N.G. Permits 3214 & 3216

Federal Project Number:
38-6-4-66-1

C. L. LAKE

January, 1971

REPORT

on a

REFLECTION SEISMOGRAPH SURVEY

conducted in

NORTH WEST TERRITORIES, ALBERTA

Latitude 60° 00' to 60° 10'

Longitude 117° 20' to 117° 35'

and

Township 126, Ranges 19 and 20, West 5th Meridian

SWEDE CREEK PROJECT

CAMERON HILLS PROJECT

STEEN RIVER PROJECT

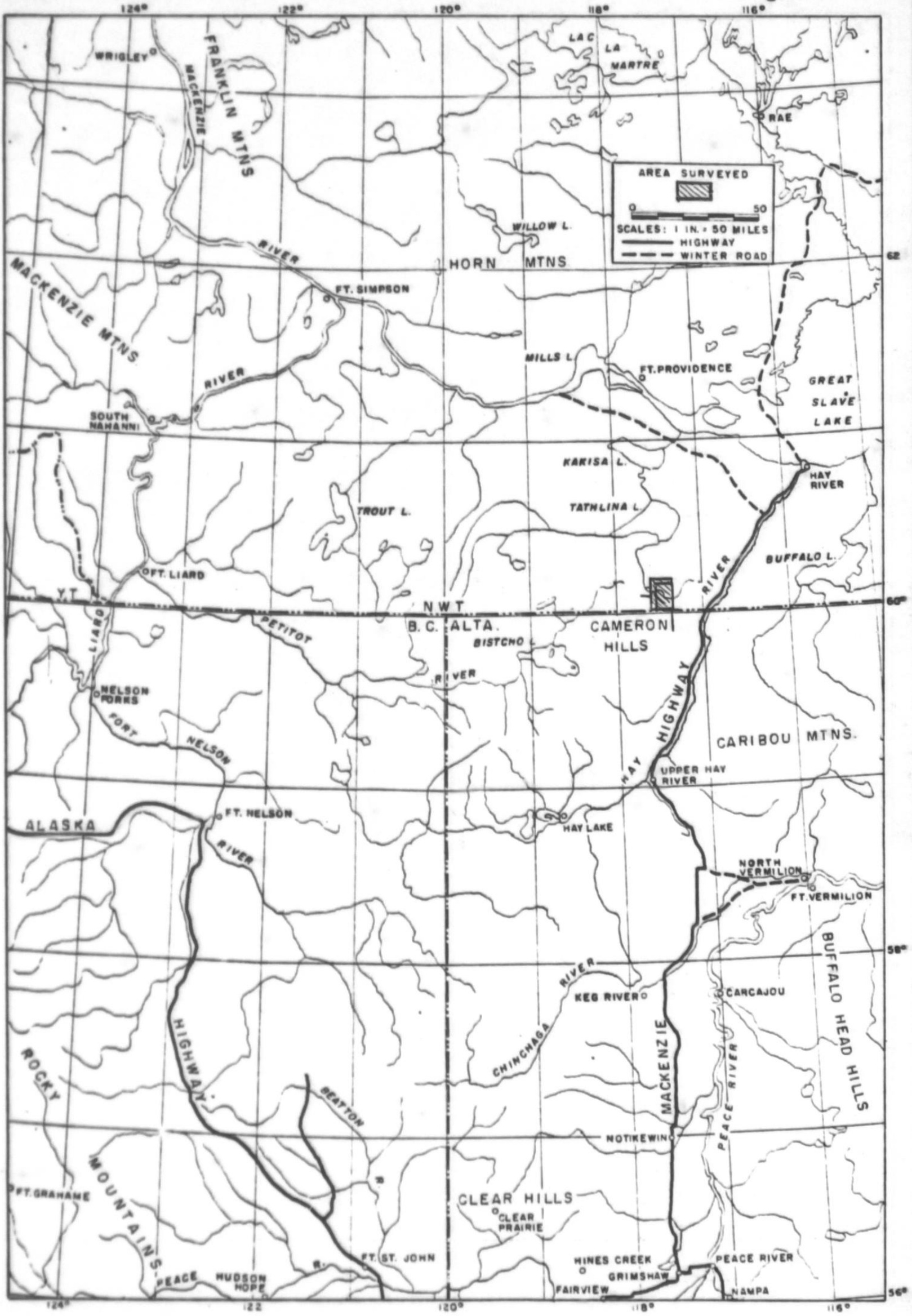
for

HUDSON'S BAY OIL AND GAS COMPANY LIMITED

Calgary, Alberta.

Seismograph Service Corporation of Canada

Calgary, Alberta


124°
122°
120°
118°
116°
WRIGLEY
MACKENZIE
FRANKLIN MTNS
LAC LA MARTRE
RAE
AREA SURVEYED
0 50
SCALES: 1 IN. = 50 MILES
HIGHWAY
WINTER ROAD
WILLOW L.
RIVER
HORN MTNS
62
MACKENZIE MTNS
FT. SIMPSON
MILLS L.
FT. PROVIDENCE
GREAT SLAVE LAKE
RIVER
SOUTH NAHANNI
KARISA L.
HAY RIVER
TROUT L.
TATHLINA L.
FT. LIARD
BUFFALO L.
RIVER
Y.T.
N.W.T.
60°
PETITOT
B.C.
ALTA.
BISTCHO L.
CAMERON HILLS
RIVER
NELSON FORKS
FORT NELSON
HAY
HIGHWAY
CARIBOU MTNS.
UPPER HAY RIVER
ALASKA
FT. NELSON
RIVER
HAY LAKE
NORTH VERMILION
FT. VERMILION
BUFFALO HEAD HILLS
58°
RIVER
KEG RIVER
CARCAJOU
CHINCHAGA
ROCKY
HIGHWAY
BEATTON
MACKENZIE
PEACE RIVER
NOTIKEWIN
FT. GRAHAME
MOUNTAINS
CLEAR HILLS
CLEAR PRAIRIE
PEACE
HUDSON HOPE
R.
FT. ST. JOHN
HINES CREEK
GRIMSHAW
PEACE RIVER
FAIRVIEW
NAMPA
56°
124°
122
120°
118°
116°

INDEX

	Page
INTRODUCTION	4
DISCUSSION	4
APPENDICES	
EFFICIENCY STATISTICS	13
FILTER CURVES	14
SPREAD DIAGRAM AND SUBSURFACE COVERAGE	15
DIAGRAM OF COMPUTATION USED	16
FIELD MATERIAL SUBMITTED SEPARATELY	17

INTRODUCTION

A reflection seismograph survey was conducted in the Northwest Territories between Latitude 60° 00' and 60° 10', and between Longitude 117° 20' and 117° 35'. One line, seven miles in length, was shot to the south into Alberta in order to tie the H. B. Cameron Hills 12-30 well. The southeast corner of the survey is located twelve miles west of the McKenzie Highway on the Alberta-Northwest Territories border. The survey extends approximately twelve miles to the west from this point and nine miles to the north. The reconnaissance program consisted of three by three mile loops covering ninety-six square miles.

Shooting was started in Mid December, 1965 and terminated at the end of February, 1966.

The program was shot by Seismograph Service Corporation of Canada, Party CA-149-A. The Party Chief was John W. Chovin, Party Manager was W. L. Douglas. Supervision was by L. G. Morris, A. A. Milton and W. Webb.

Primary objective of the survey was to delineate if possible, the Middle Devonian Keg River Reef.

DISCUSSION

This interpretation of the data recorded was made from the field records as the current records arrived from the field. A comparison was made between this data with that from corrected cross sections obtained after the field tapes were stacked in the SSC Tulsa replay centre. The data obtained from the two methods checked closely although definite improvements in quality were noted on the stacked sections.

The contour interpretation of the data from all levels mapped shows a general southwest regional dip interrupted by local anticlinal and synclinal trends. These local features are contoured as trending in a northwest-southeast direction across the area. It is possible with the present control available to contour these features as trending in a northeast-southwest direction.

The feature considered to be of greatest interest on all maps is an anticlinal structure trending

in a northwest-southeast direction, crossing the intersection of Lines 117°35' and 60°07.5' and then to the south beyond the limits of control. A closed high centres around Shot Point 531 on Line 117°30'. Approximately 15 milliseconds of closure is present on this feature. The stacked replay cross sections submitted with this report show reef evidence near Shot Point 719 on this line and on the same anticlinal feature. This structure is most evident at Slave Point depth. The structurally high feature is coincident with a thinning of section shown on the Hay River to Slave Point map. Further evidence of reefing is the deterioration of the Pre-Cambrian reflection in this area.

A second anticlinal feature of interest is located to the north and east and paralleling the high trend discussed previously. Critical dip to the northeast is doubtful on this trend and additional control is required to determine the actual presence of east and north dip on this feature. As the data is presently contoured, the high spot on this trend centers near Shot Points 295 to 300 on Line 60°02.5'. A thinning of section along this trend is noted on the interval maps submitted with this report.

RECOMMENDATIONS

An additional line, extending in a east-west direction, is recommended in the vicinity of Shot Point 719 where reef evidence is noted on the Cross Sections. Additional detailing may be required on completion of the remainder of the desired reconnaissance shooting on the Swede Creek and Cameron Hills Projects.

The six fold Common Depth Point technique used in recording the data resulted in a considerable improvement in quality of the final corrected cross sections obtained. At those locations where holes could not be drilled due to boulders or gravel, lakes, misfires or other conditions beyond the control of the operator, a significant decrease in quality of the reflections were noted on the cross sections. It is therefore recommended that the six fold Common Depth Point procedures be continued where possible in any future work.

Drift corrections computed and applied to the data are not considered to be completely reliable due to the poor quality of the first breaks on the records. Some improvement in quality might be obtained by drilling additional holes every one quarter or one half mile and loading much larger charges. This is necessary because reflection quality is much better using smaller charges and holes seldom stay open for the second shot necessary for the larger charges. Additional drill power would be required for this in order not to reduce field production.

Production was limited mainly by lack of sufficient drill power to stay ahead of the recording crew. Other limiting factors were the extreme cold and the large number of "dragouts" by the recording crew caused by lakes and muskeg swampy areas where the dozers and trucks could not travel.

A minimum of four rotary drills with sufficient personnel for working double tours are recommended. At least two extra water trucks are recommended for a total of six water units. The Becker impact drill used in the area did not prove to be practical and this type drill unit is not recommended for future work.

A more mobile camp including a fuel sloop for keeping fuel tanks on wheels are recommended in order to keep the camp more mobile and reduce drive time of the field trucks to a minimum.

It is believed that the following equipment would enable the recording crew to obtain higher production and reduce total cost per mile.

4	Transmitters and receivers for communications between Recorders, Shooters and Line Trucks.
2	Transmitters and receivers for time break and uphole time for Recorder and Shooting Truck.
1	Remote control firing unit, for Recorder and Shooter.
2	One ton cable "Line" trucks.
1	Shooting Truck.

1 Recording Truck.
12 One quarter mile cables.
4 One quarter mile 24 conductor extension cables
1500 Geophones (using 20 phones per trace).
9 Man Recording crew consisting of Observer, Shooter, Shooters Helper, 6 Recording Helpers.

It is recommended that field playbacks be held to a minimum in order to conserve field time. One extra man capable of making playback records at night would probably be desireable. This man could also help count and process records before shipping to the computing office thus allowing a possible reduction in central office personnel.

A surveyor, Rodman and two Chainmen would be necessary in order to keep ahead of the above listed Recording and Drill units.

Drill and survey units should move into the area as soon as ground conditions permit and enough ahead of the Recording and Shooting crew to have several miles of line drilled out in advance.

OPERATIONS

1. General Accessibility:

Surface Conditions

The prospect area is uninhabited and there are few trees in the area. The surface is covered by muskegs and lakes and is covered by ridges of gravel and boulders trending in a general east-west direction.

Topography

The area is generally hilly with the surface elevations increasing to the west and northwest. Drainage is poor and is to the north--east into Tathlina Lake and to the southwest into Bistcho Lake.

Logistics

Camp was first located at Latitude 60° 00', Longitude 117° 20', this being as far as the bulldozers had cleared when the crew moved into the area. Camp was moved at a later date near the

intersection of Lines Latitude 60° 05', Longitude 117° 30'. Drive time to the field averaged about one hour for the Recorders and two or more hours for the drills. Drive time from the second camp location to Hay River or High Level was about three hours in a pickup truck.

Some towing of equipment by dozers was necessary in the northwest part of the prospect. Snow ploughing was required periodically during the work period.

2. Drilling:

Formations encountered were muskeg, clay, gravel and boulders. Insert and Rock bits were used. Average hole depth was 40 feet, and gravel and/or boulders were encountered in most holes. A Becker Hammer unit was employed for a period of one month to help drill the gravel holes but was not successful due to the amount of clay encountered in the holes.

3. Surveying:

Permits and Releases

None.

Surveying Instruments

K & E Transit - Horizontal control was plotted on maps using a scale of 1" equals 4,000'.

Bench Marks

The survey was tied to several Geodetic Survey of Canada Bench Marks located along the 60th parallel.

Elevation and Traverse Ties

Traverses were tied with a maximum of 1.5' vertical and 150' horizontal error.

4. Outside Services:

Three bulldozers, 2 D-7's and one D-8 were contracted from Bain Brothers, Edmonton, Alberta, their work was considered to be very good.

Three drills were considered to be sufficient for conducting the survey

when the crew first moved into the area. These were two conventional Mayhew 1000 units and one Sewell Auger unit. The auger drill was soon found to be useless in the area due to gravel and boulders in the holes and was released. These three units were provided by Apache Drilling Company, Calgary, Alberta.

Additional rotary drills were provided in January as follows: one conventional Mayhew 1000 by Sedco Drilling Company and one Mayhew 1000 by Western Geophysical Company. The latter was borrowed temporarily from another crew under contract to Hudson's Bay Oil and Gas Company Limited and was released to this company at a later date and before termination of field work in the area.

Camp was provided by Atco Industries Limited and was catered by Crown Caterers, Edmonton, Alberta. Catering services during the season left a lot to be desired.

5. Recording:

a) Equipment - Amplifiers used were SSC IMI-AAD modification "O", Serial #15. Tape Recorder used was a 26 trace fixed head Techno.

b) Experimentation - Before production shooting was started an experimental hole was shot at varying depths and with varying charge sizes. Best results from this experimental program was obtained from a depth of 40 to 50 feet with charge sizes not greater than 1 1/4 pounds.

Two expanded spreads were shot at this time. These spreads consisted of a straddle hole shot with cables laid out for one half mile in both directions. Shots were then taken from each end of the cable using the same set-up. Good reflections were not recorded across the longer spreads shot. The lack of good reflection quality resulted in little information for the study of vertical velocities and the determination of the presence of any multiple reflections on the records.

Though no coherent wave patterns were recorded on a noise spread shot a comparison was made with 10 geophones per trace spaced over 110 feet and 20 geophones per trace spaced over 220 feet. The latter array yielded much better results. Additional geophones were ordered and all production shooting after January 15, 1966 was done with 20 geophones per trace.

A portion of Line 117° 20' was played back using a three fold stack and the quality of the cross sections was much inferior to that resulting from the six fold stack method. This result is supported by a significant decrease in the quality of the stacked sections where six fold coverage could not be obtained for operational reasons.

c) Spread Lengths - All holes were shot with straddle spreads. Station spacing was 220 feet with stations 12 and 13, 110 feet from the shot hole giving a spread length of 2520 feet.

d) Equipment Adjustments - Recording filter 11 - 15, cutoffs 17 - 120 cps at 50% response, 44 - 66 cps at 100% response. Playback filter for field recorder was 11 - 14 with cutoff frequencies of 17 - 73 cps at 50% response, peak frequency 45 cps. Playback filter for cross sections R - 12, out to 61 cps at 70% response.

No instrument mixing was used either in recording or playback.

e) Routine Instrument Checks - Test tapes were provided before beginning work to check AVC action and response and head alignment and head sequence.

A geophone oscillator check was made daily.

COMPUTATION

1. Special Methods - An elevation velocity of 7,000 feet per second was used to correct data to a datum of 2,200 feet above sea level.

A modified uphole correction was used to correct the weathered layer. However, the refraction breaks were very poor even at the near stations and it was frequently necessary to adjust this correction in order to keep it in line with the uphole times and step out on the records. No weathering was recorded at many locations, this almost always being the case where frozen formations were encountered.

2. LVL Corrections - At the beginning of work the Hudson's Bay Oil and Gas Company Limited Critical Distance method of computation was used. This method was compared with a curved path weathering analysis on part of line 117° 20' and all of lines 117° 18' and R20-0 and it was found that the latter method tended to give somewhat

smoother data. The curved path weathering analysis was computed generally every sixth shot point and drift delay times for intermediate points were obtained by interpolation. This correction was computed on form HBOG 51-685.

No drift correction was applied to the playback section for Shot Points 23 to 44 on Line 117° 20'.

The corrections computed by the Critical Distance method were used on playback sections for Lines 117° 18' and R20-0. Corrections computed by both the Critical Distance method and the Curved Path method have been posted on the SSC copy of the above listed playback sections submitted with this report in order that the corrected data obtained from the sections can be based on the Curved Path computations.

INTERPRETATION

1. Velocity Data:

   a) Source of Reflection Identification - CVL surveys and synthetic records were made available from the Shell Oil Kakisa River 1 and H. B. Cameron Hills 12-30 wells. Reflection identifications were made by comparison of nearby records with the synthetic seismogram from the H. B. Cameron Hills 12-30 well. Program did not approach near enough to the Shell Oil Kakisa River 1 well to make use of this well for correlation purposes.

   b) Velocity Changes - The surface elevations on Line R20-0 decreases from 2357 feet at Shot Point 1 to 1314 feet at Shot Point 100. This decrease in elevation was accompanied by an increase in the velocity of the Ve refractor from near 6,800 feet per second to near 9,000 feet per second. No adjustment of data was attempted for this apparent steep velocity gradient which covers only part of line R20-0 and has no effect on the interpretation on the main portion of the program in the Cameron Hills project. Velocity changes of the Ve refractor ranged from 6,500 to 7,000 feet per second in the eastern portion of the Cameron Hills project to 6,000 to 6,500 feet per second in the western portion of the project.

INTERPRETATION

1. Maps Submitted:

Structural Maps:

Hay River
Slave Point
Pre-Cambrian

Interval Maps:

Hay River to Slave Point
Slave Point to Pre-Cambrian
Hay River to Pre-Cambrian

An attempt was made to map an Elk Point reflection, however, energy from the Muskeg and Keg River horizons are within one cycle of this event causing cancellation and additions to any energy derived from this source.

2. Sections Submitted:

Plotted structural sections uncorrected for drift were made for all lines shot. Three sections are based on data from each point shot. Corrected sections for each line were prepared in the SSC Tulsa replay centre based on six fold stack. A portion of one line was replayed using a three fold stack. A replay section was prepared showing continuous single point coverage for each line in order to assist in qualifying reliablility of the final stacked sections.

Respectfully submitted,

Seismograph Service Corporation
of Canada

Prepared by: _____
J. W. Chovin, Party Chief.

Date: May 15, 1966.

APPENDIX I

Efficiency Statistics

Recording:

Date work started:	December 17, 1965.
Date work completed:	February 28, 1966.
Working days:	
Steen River:	6.18
Swede Creek:	4.48
Cameron River:	48.42
Set Ups:	
Steen River:	19
Swede Creek:	7
Cameron River:	197
Profiles:	
Steen River:	196
Swede Creek:	68
Cameron River:	1917
Basement traverse:	
Steen River:	7.71
Swede Creek:	3.25
Cameron River:	82.75
Miles of basement traverse per 10 hour day:	
Steen River:	1.24
Swede Creek:	0.70
Cameron River:	1.08
Average distance of field:	
Steen River:	4.5 miles
Swede Creek:	2.0 miles
Cameron River	6.0 miles

Shooting:

Total shot points shot:	
Steen River:	97

Shooting: cont'd

Swede Creek:	41
Cameron River:	987

Total number of shots:

Steen River:	99
Swede Creek:	49
Cameron River:	1110

Pounds of dynamte used:

Steen River:	97 1/2
Swede Creek:	45
Cameron River:	832 1/2

Pounds of dynamite per profile:

Steen River:	1.0
Swede Creek:	0.66
Cameron River:	0.43

Drilling:

Type and number of drills used: As many as four rotary drills were used at one time; three rotary drills were used most of the time.

A hammer drill was used during January, 1966.

An auger was tried for a few days in December and released.

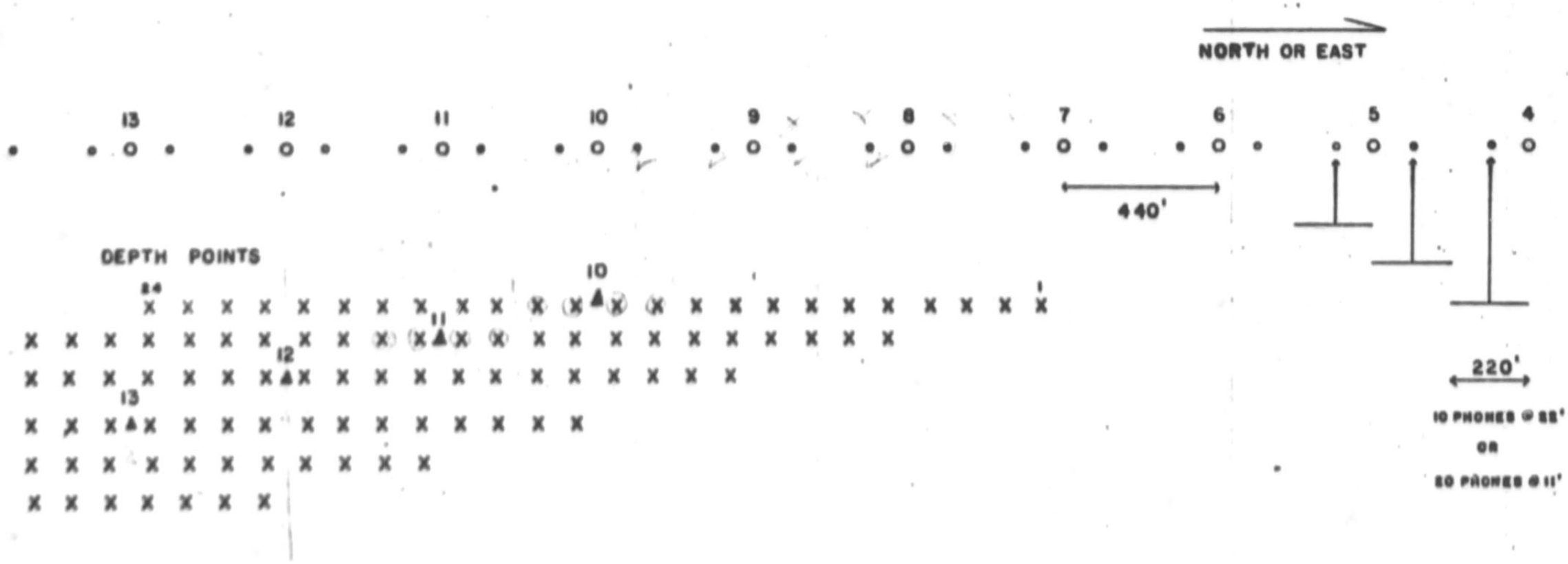
Total holes drilled:

Steen River:	97
Swede Creek:	44
Cameron River:	1049

Footage per 10 hour day per rig:

Apache #1	146 feet
Apache #2	158 feet
Western	154 feet
Sedco	177 feet
Becker (Hammer drill)	130 feet

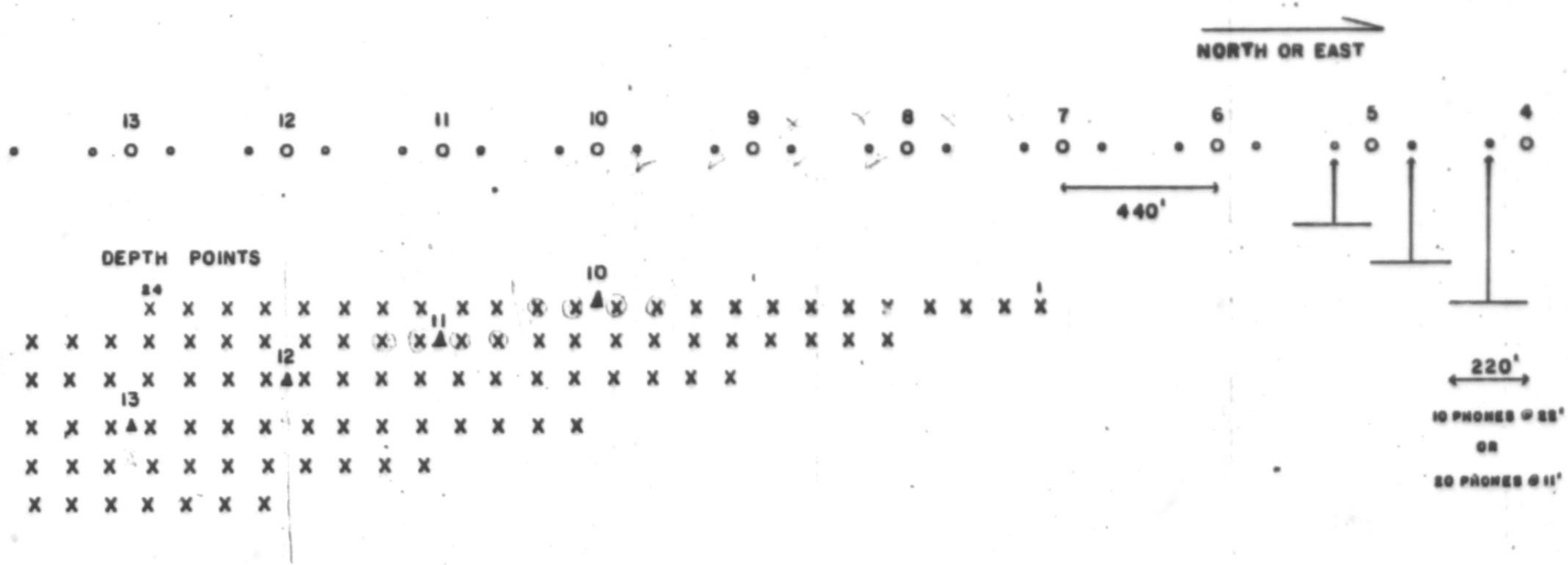
SPREAD DIAGRAM AND SUBSURFACE COVERAGE



LEGEND

SHOT HOLE	o
GEOPHONE STATION	•
DEPTH POINT	X

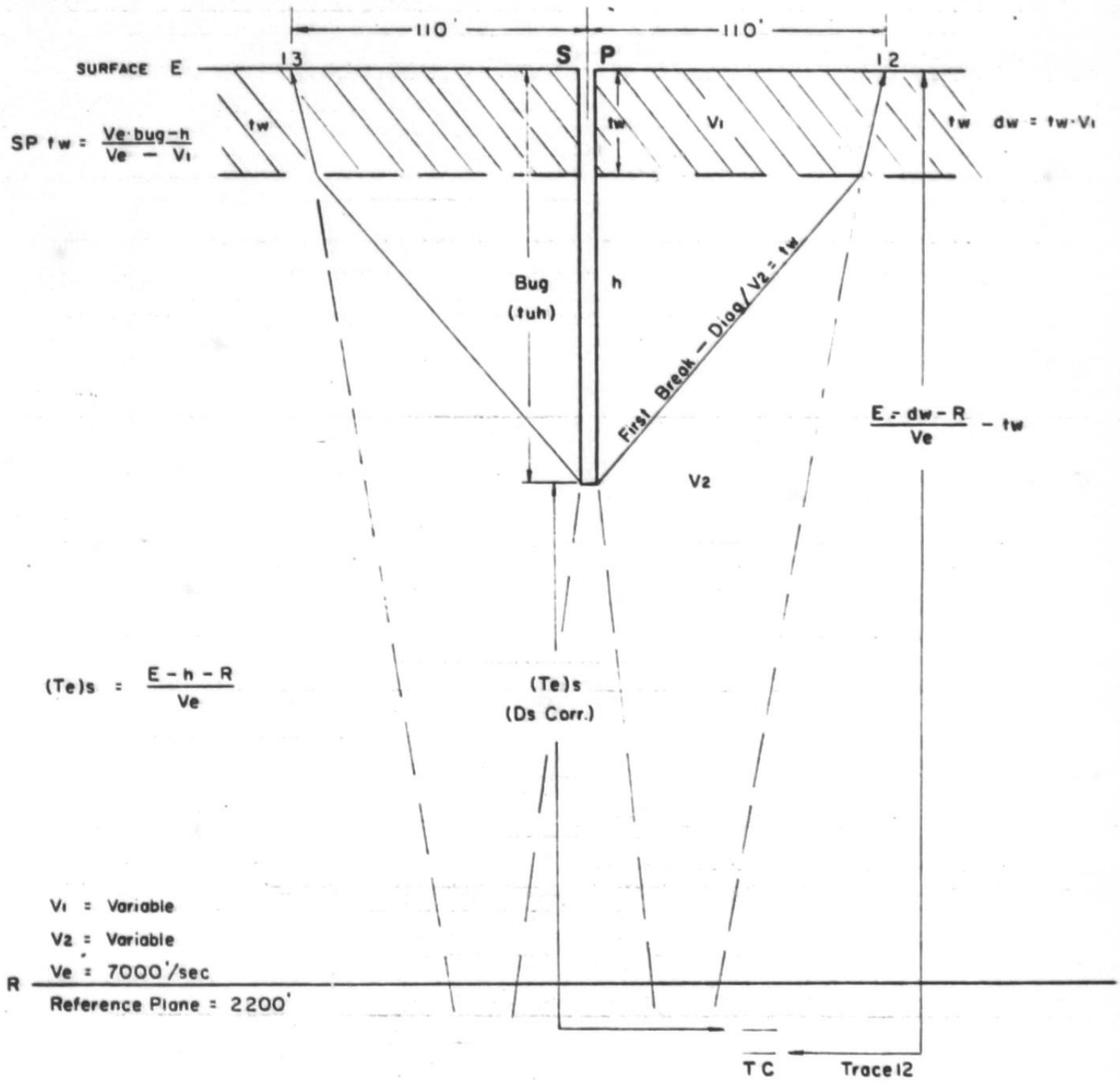
SPREAD DIAGRAM AND SUBSURFACE COVERAGE



LEGEND

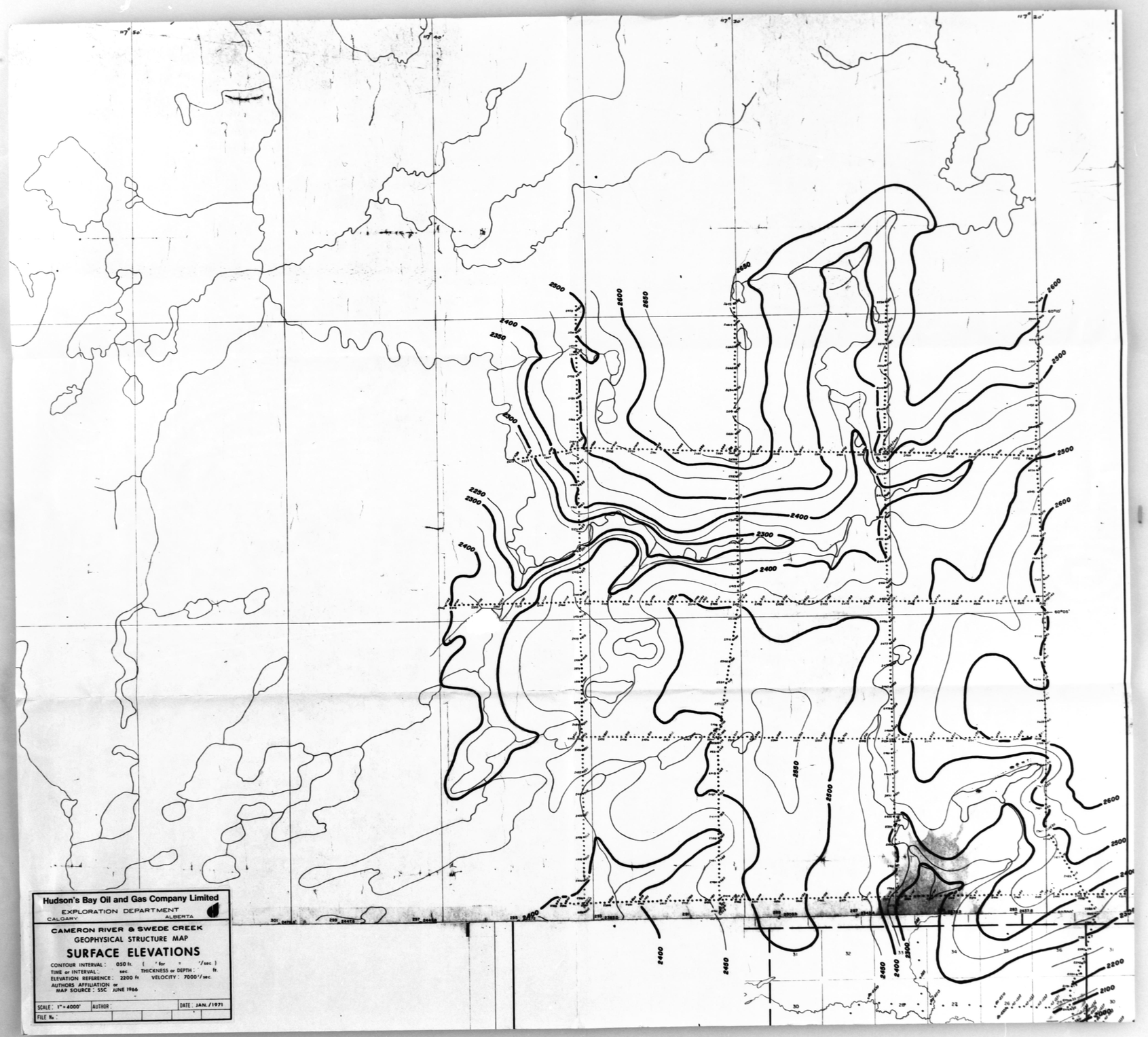
SHOT HOLE	o
GEOPHONE STATION	•
DEPTH POINT	X

DIAGRAM OF COMPUTATION USED



NOTE :

NEAR GEOPHONES OF STATIONS 11 AND 14 LOCATED AT FLAG POSITIONS OF 12 AND 13. THEREFORE, FIRST BREAKS OF 11 AND 14 USED FOR MODIFIED UPHOLE CORRECTION.



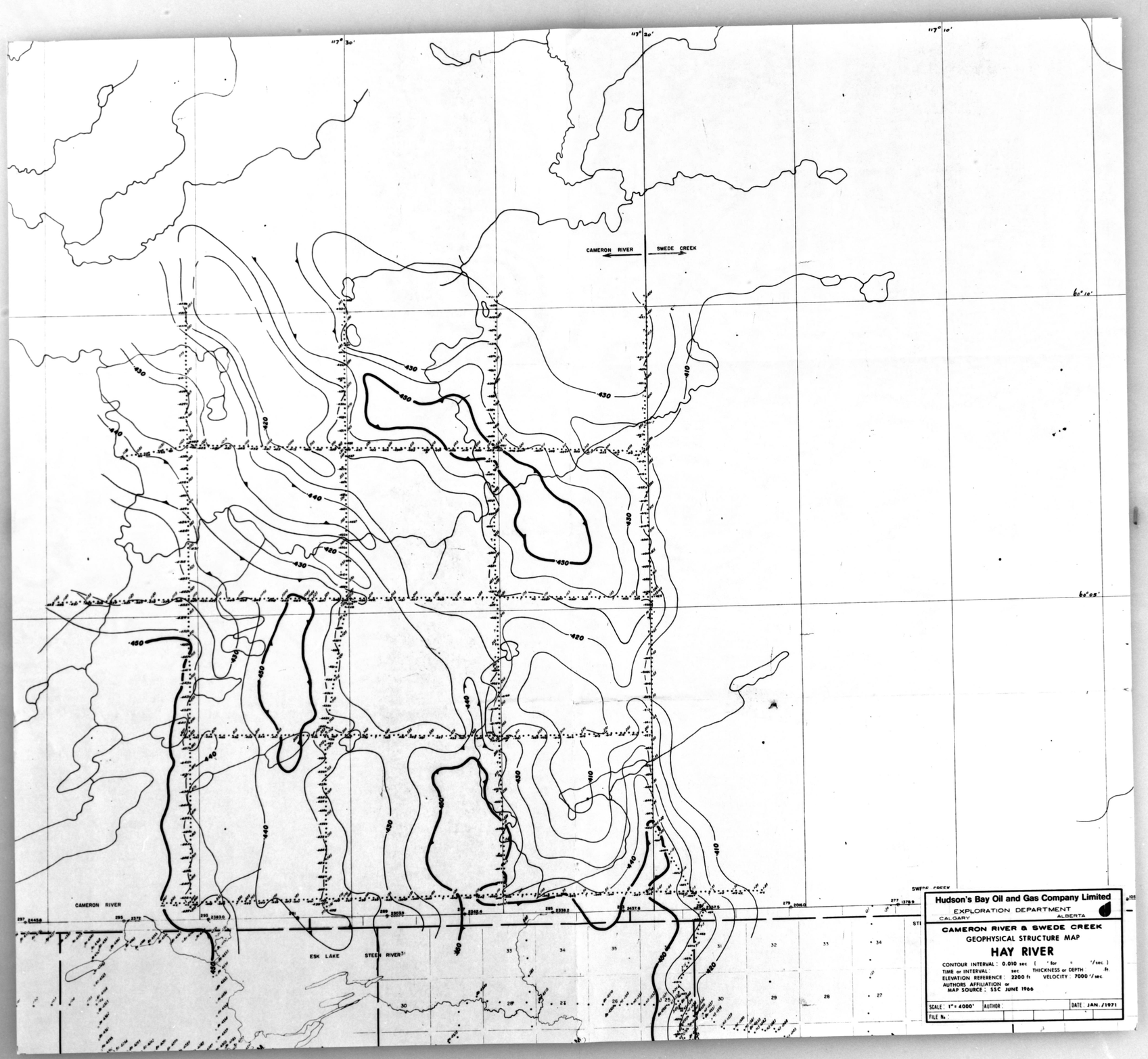
Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY ALBERTA

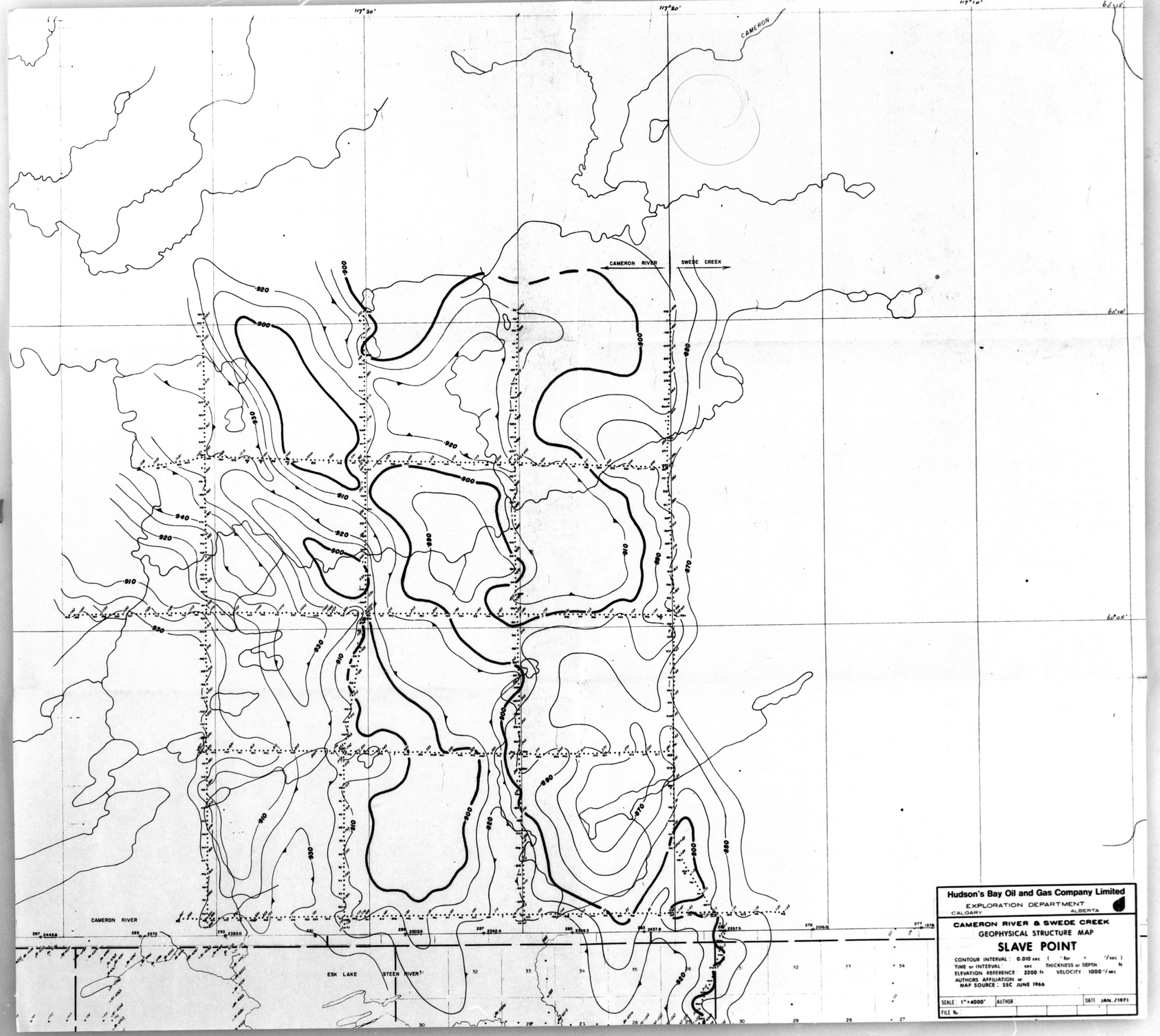
CAMERON RIVER & SWEDE CREEK
GEOPHYSICAL STRUCTURE MAP

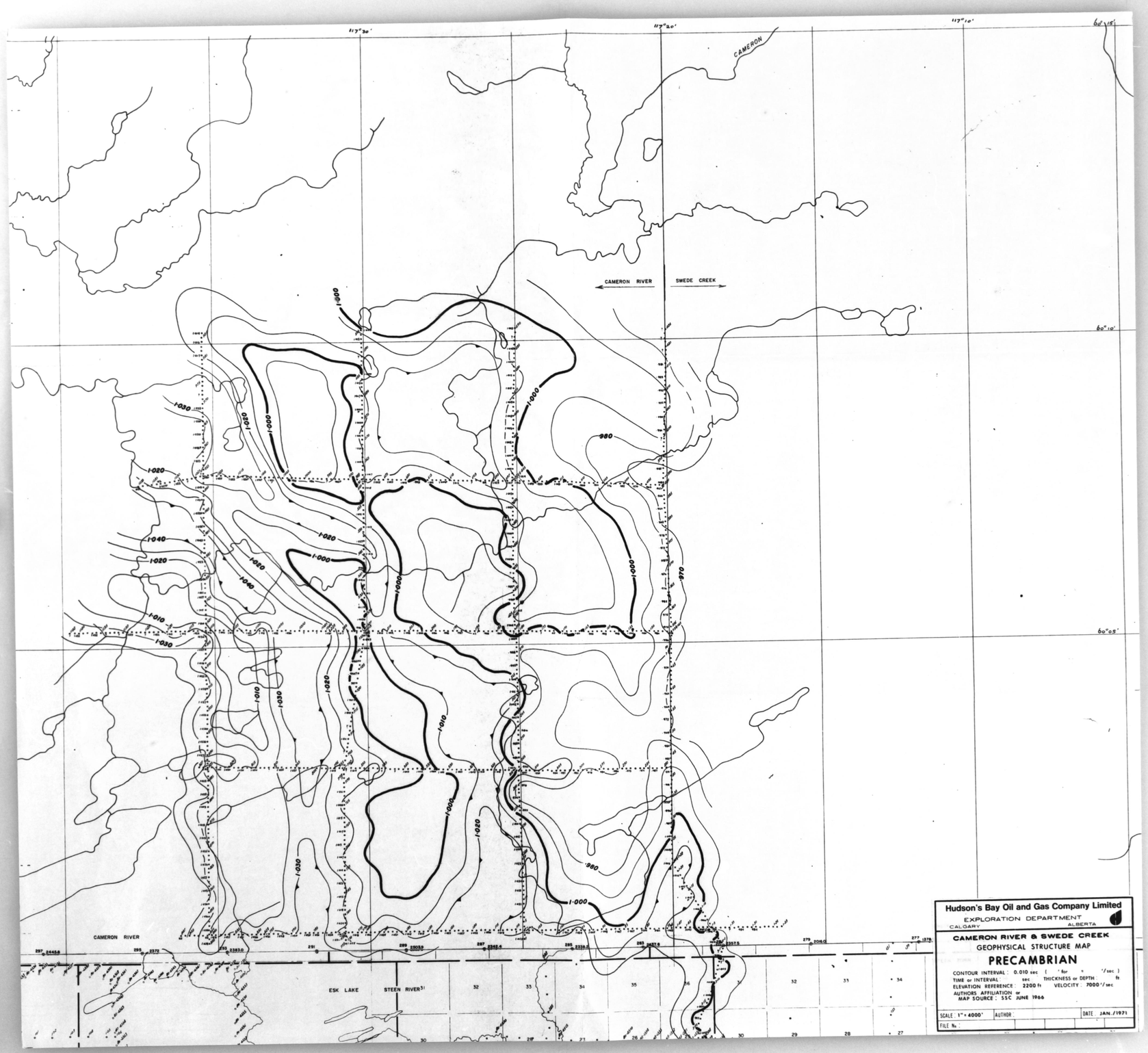
SURFACE ELEVATIONS

CONTOUR INTERVAL: 050 ft. (' for = '/sec)
TIME or INTERVAL: sec. THICKNESS or DEPTH: ft.
ELEVATION REFERENCE: 2200 ft VELOCITY: 7000'/sec.
AUTHORS AFFILIATION or MAP SOURCE: SSC JUNE 1966

SCALE: 1" = 4000' AUTHOR: DATE: JAN./1971
FILE No.:


117° 30'
117° 20'
117° 10'
60° 10'
60° 05'
CAMERON RIVER
SWEDE CREEK
430
420
440
450
410
ESK LAKE
STEEN RIVER
CAMERON RIVER
SWEDE CREEK
Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY ALBERTA
CAMERON RIVER & SWEDE CREEK
GEOPHYSICAL STRUCTURE MAP
HAY RIVER
CONTOUR INTERVAL : 0.010 sec (' for ' '/sec)
TIME or INTERVAL sec THICKNESS or DEPTH ft
ELEVATION REFERENCE : 2200 ft VELOCITY : 7000 '/sec
AUTHORS AFFILIATION or
MAP SOURCE : SSC JUNE 1966
SCALE : 1" = 4000' AUTHOR :
DATE : JAN./1971
FILE No :


117°30'
117°20'
117°10'
60°15'
60°10'
60°05'
CAMERON
CAMERON RIVER
SWEDE CREEK
CAMERON RIVER
ESK LAKE
STEEN RIVER
Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY
ALBERTA
CAMERON RIVER & SWEDE CREEK
GEOPHYSICAL STRUCTURE MAP
SLAVE POINT
CONTOUR INTERVAL : 0.010 sec (' for ' '/sec)
TIME or INTERVAL : sec THICKNESS or DEPTH : ft
ELEVATION REFERENCE : 2200 ft VELOCITY : 1000 '/sec
AUTHORS AFFILIATION or
MAP SOURCE : SSC JUNE 1966
SCALE : 1"=4000'
AUTHOR
DATE JAN./1971
FILE No.


117°30'
117°20'
117°10'
60°15'
60°10'
60°05'
CAMERON
CAMERON RIVER
SWEDE CREEK
1·000
1·020
1·040
1·010
1·030
980
970
ESK LAKE
STEEN RIVER
Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY ALBERTA
CAMERON RIVER & SWEDE CREEK
GEOPHYSICAL STRUCTURE MAP
PRECAMBRIAN
CONTOUR INTERVAL : 0.010 sec (' for ' '/sec)
TIME or INTERVAL sec THICKNESS or DEPTH ft
ELEVATION REFERENCE : 2200 ft VELOCITY : 7000'/sec
AUTHORS AFFILIATION or MAP SOURCE : SSC JUNE 1966
SCALE : 1" = 4000'
AUTHOR :
DATE : JAN./1971
FILE No :

117°30'

117°20'

117°10'

60°15'

60°10'

60°05'

CAMERON

CAMERON RIVER

SWEDE CREEK

THIN

490

480

470

460

450

440

CAMERON RIVER

ESK LAKE

STEEN RIVER

SWEE

STEE

32

33

34

35

36

31

32

33

34

Hudson's Bay Oil and Gas Company Limited

EXPLORATION DEPARTMENT

CALGARY ALBERTA

CAMERON RIVER & SWEDE CREEK

GEOPHYSICAL ISOCHRON MAP

HAY RIVER — SLAVE POINT

CONTOUR INTERVAL : 0.010 sec. (' for ' ' /sec.)

TIME or INTERVAL : sec. THICKNESS or DEPTH : ft.

ELEVATION REFERENCE : 2200 ft. VELOCITY : 7000 '/sec.

AUTHORS AFFILIATION or MAP SOURCE : SSC JUNE 1966

SCALE : 1" = 4000' | AUTHOR : | DATE : JAN./1971

FILE No. :

117°30'

117°20'

117°10'

60°15'

60°10'

60°05'

CAMERON

CAMERON RIVER

SWEDE CREEK

THIN

350

360

370

380

390

400

560

570

580

590

CAMERON RIVER

ESK LAKE

STEEN RIVER

Hudson's Bay Oil and Gas Company Limited

EXPLORATION DEPARTMENT

CALGARY ALBERTA

CAMERON RIVER & SWEDE CREEK

GEOPHYSICAL ISOCHRON MAP

HAY RIVER — P€

CONTOUR INTERVAL: 0.010 sec (' ' ' '/sec)

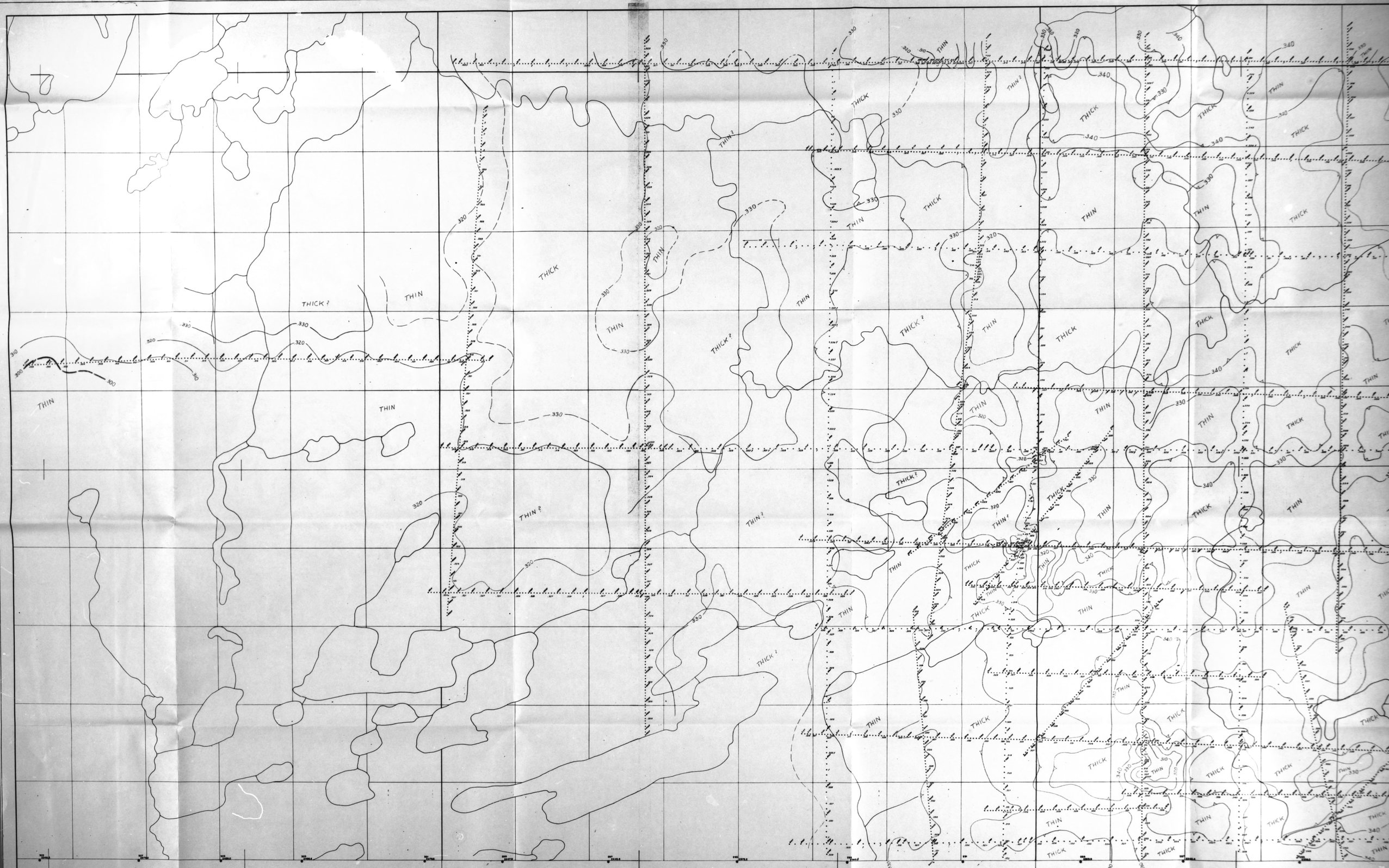
TIME or INTERVAL: sec THICKNESS or DEPTH ft

ELEVATION REFERENCE: 2200 ft VELOCITY 7000'/sec

AUTHORS AFFILIATION or MAP SOURCE: SSC JUNE 1966

SCALE: 1" = 4000' AUTHOR: DATE: JAN. / 1971

FILE No.:


THICK
THIN
THICK ?
THIN ?
330
320
340
310
300

Hudson's Bay Oil and Gas Company Limited

EXPLORATION DEPARTMENT

CALGARY ALBERTA

CAMERON RIVER "B" & SWEDE CREEK "B"

GEOPHYSICAL ISOCHRON MAP

ALEXANDER FALLS — SLAVE PT.

CONTOUR INTERVAL 0.010 sec. [40 ' ft= 11,930 ' / sec.]

TIME or INTERVAL 320 sec. THICKNESS or DEPTH 19000 ft

ELEVATION REFERENCE ft VELOCITY ' / sec.

AUTHORS APPLICATION or MAP SOURCE : NAT 324 AUG. 1967

SCALE 1" = 2000' AUTHOR DATE JAN. 21/67

FILE No.

2 of 2

117°30'

117°20'

117°10'

60°15'

60°10'

60°05'

CAMERON

CAMERON RIVER

SWEDE CREEK

090

100

110

THIN

CAMERON RIVER

ESK LAKE

STEEN RIVER

Hudson's Bay Oil and Gas Company Limited

EXPLORATION DEPARTMENT

CALGARY ALBERTA

CAMERON RIVER & SWEDE CREEK

GEOPHYSICAL ISOCHRON MAP

SLAVE POINT – P€

CONTOUR INTERVAL : 0.010 sec (' for ' '/sec)

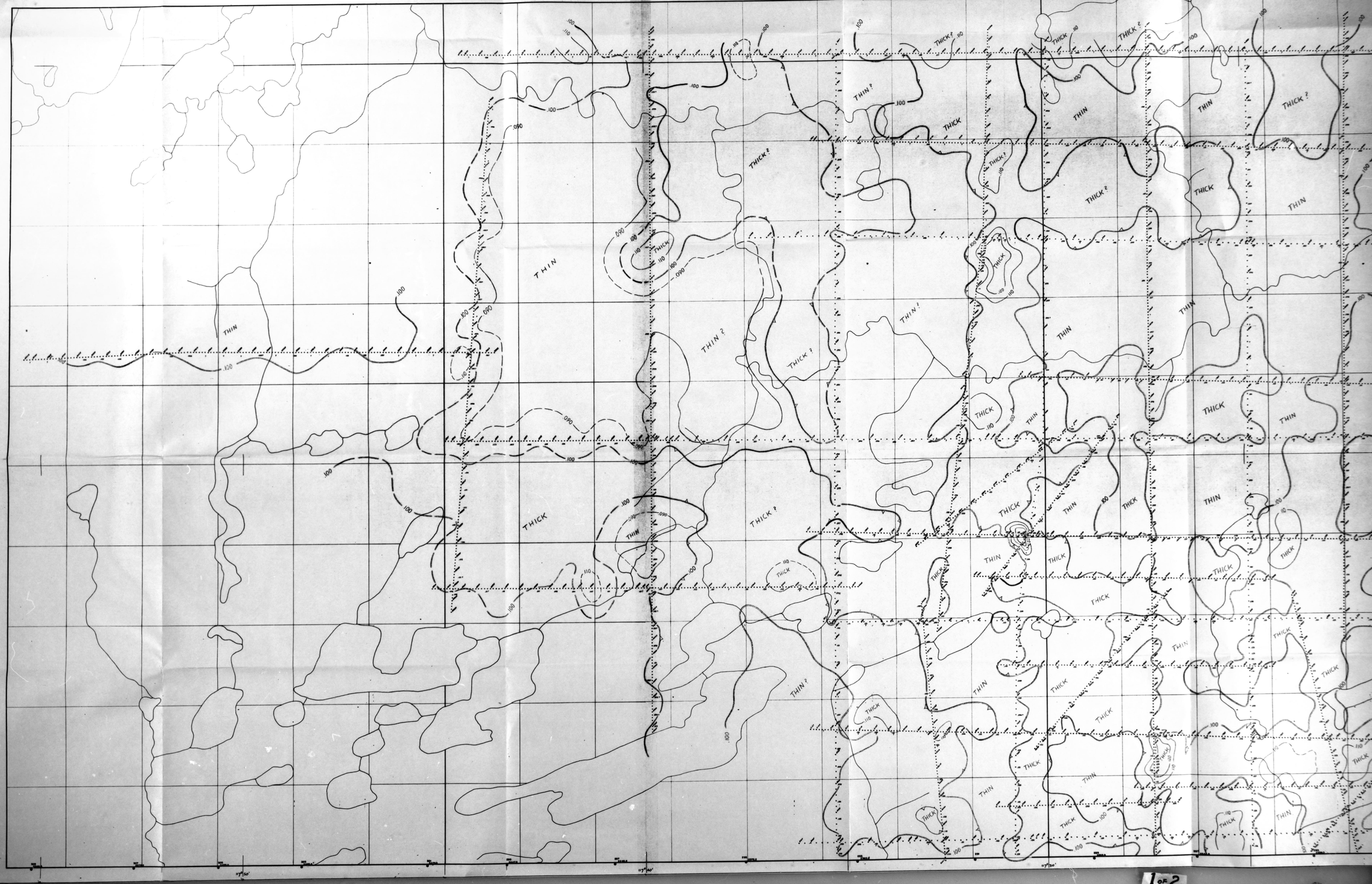
TIME or INTERVAL : sec THICKNESS or DEPTH : ft

ELEVATION REFERENCE : 2200 ft VELOCITY : 7000 '/sec

AUTHORS AFFILIATION or MAP SOURCE : SSC JUNE 1966

SCALE : 1" = 4000' AUTHOR DATE : JAN. / 1971

FILE No :


THIN
THICK
THIN ?
THICK ?
.100
.110
.090
.080
117°50'
117°40'
117°30'


Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY ALBERTA
CAMERON RIVER "B" & SWEDE CREEK "B"
GEOPHYSICAL ISOCHRON MAP
SLAVE POINT – P€
CONTOUR INTERVAL : 0.010 sec. (98 ' for Vi = 19,250 '/sec.)
TIME or INTERVAL : 0.100 sec THICKNESS or DEPTH 963 ft
ELEVATION REFERENCE ft VELOCITY '/sec.
AUTHORS AFFILIATION or
MAP SOURCE : NAT 324 AUG. 1967
SCALE 1" = 2000' AUTHOR DATE JAN. /1971
FILE No.
117°40'
117°30'
117°20'