

IMPERIAL OIL ENTERPRISES LTD.  
Producing Department - Western Region  
Report on Reflection Seismic Programs  
Fort Providence N.W.T. Area

By: O. Friesen  
November 16, 1970

Department Project Nos.: 7-6-4-69-1  
7-6-4-69-10

7-6-4-69-10

IMPERIAL OIL ENTERPRISES LTD.  
Producing Department - Western Region

Reflection Seismic Program

Ft. Providence Area

Permits: 4151, 4152, 4153, 4154, 4156, 4157  
4158, 4159, 4160, 4193, 4194, 4490, 4491, 4494,  
4495, 4560, 4561

STAGE I: Ray Geophysical Co. Party 13  
from January 31 to March 19, 1969

IOE P.W.O. No: A0001-23

Department Code No: 7-6-4-69-1

STAGE II: Teledyne Exploration Ltd. Party 16  
from January 9 to February 17, 1970

IOE P.W.O. No: A080133

Department Code No: 7-6-4-69-10

Teledyne Exploration Ltd. Party 18  
from January 7 to April 12, 1970

IOE P.W.O. No: A080133

Department Code No: 7-6-4-69-10

by

O. Friesen

Southern Exploration District  
Edmonton, Alta

Date: November 16, 1970

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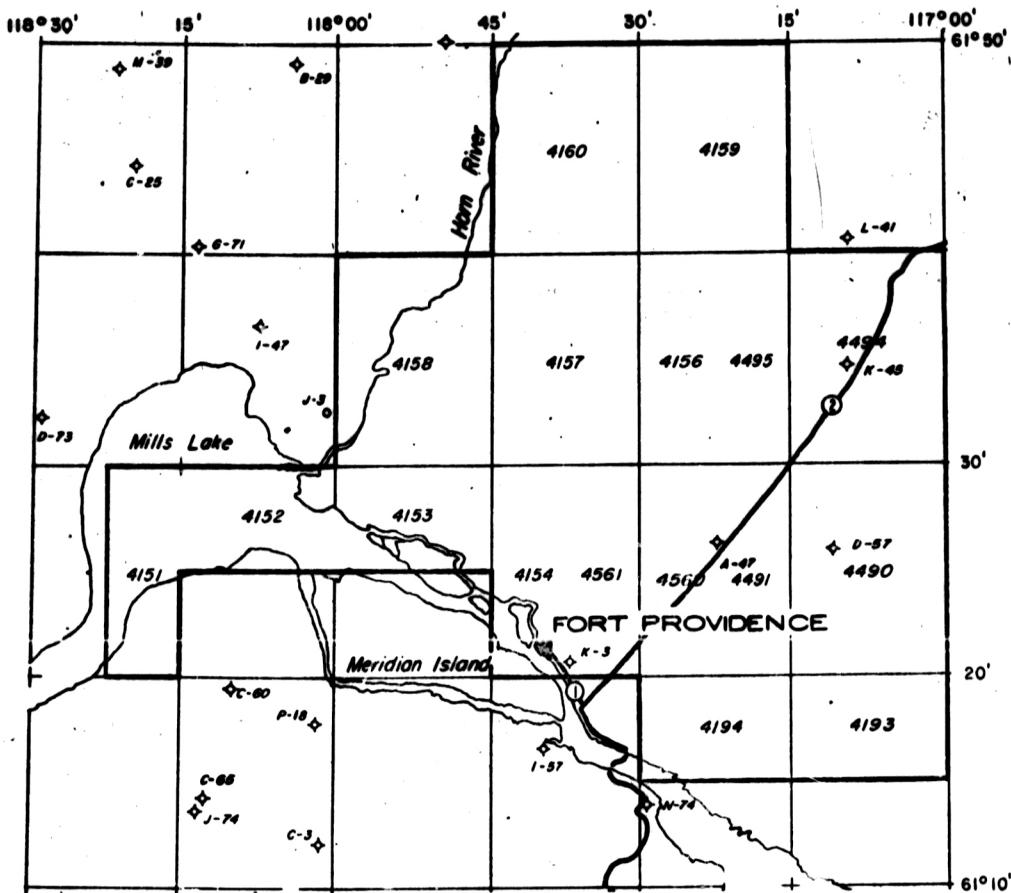
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1. Shot Point Locations and Elevations map	
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Introduction

This is a report on seismograph operations conducted by Ray Geophysical Co., Party 13 on behalf of Imperial Oil Enterprises Ltd. in the Fort Providence area from January 31, 1969 to March 19, 1969.

Also included in this report is the seismograph operations of Teledyne Exploration Ltd. Party 16 from January 7 to February 17, 1970, and Teledyne Party 18 from January 7, 1970 to April 12, 1970.

While in the Fort Providence area, the Teledyne Parties 16 and 18 did some "off-permit" shooting as well, which is not included in this report but which was done within the dates shown above.



## **FORT PROVIDENCE AREA**

IMPERIAL OIL ENTERPRISES LTD.

SCALE: 1:500,000

Statistical Data

Stage I - Ray Geophysical Co. Party 13

Dates - The move into the Fort Providence area from Fort Simpson was completed on January 30, 1969 and recording commenced on January 31 and was completed with the vehicles released on March 19, 1969.

Production - 148 miles, 1,755 shot points, average daily production 3.1 miles, 48 working days. No down-days.

Equipment - Recorder, shooting truck, reel truck, 2 survey trucks, 5 shot hole drilling rigs, 2 water trucks, 2 bulldozers. The Imperial Oil aircraft Aztec was used for supervisory and scouting work. Most of the supplies were purchased locally or brought in by charter service provided by Keir Transport and Mercury Flights.

The recording instruments were Imperial Oil digital PFS 2-10 system with binary gain amplifiers. All vehicles were mounted on wheels.

Personnel - Party Manager, Operator and Assistant, Shooter and Assistant, two surveyors, two rodmen, four geophysical helpers, five drillers, five drill helpers, water truck driver, four dozer operators, cook, cook's helper and one camp attendant.

Surveying - Horizontal angles were measured to + or - 20 seconds with a Wilde T-16 theodolite. Horizontal and vertical control was based on the baseline survey and previous seismic surveys. The survey crew was made up of two surveyors and two rodmen.

Conditions - Weather conditions for the region were typical with temperatures ranging from 0° to -50°. Some difficult drilling was encountered west of the Great Slave highway, however this did not hamper production.

Field Procedures

A 300% C.D.P. method of shooting was used with single holes at each shot point. The spread length was 1320' split. The shot hole spacing was 440 feet, station distance 110 feet and geophone coverage was 8 geophones over 110 feet. Charge sizes varied from 2½ to 5 pounds of "Geogel." Average hole depth was 40 feet.

Data Processing

All of the seismograms were corrected to a datum of +1500' A.S.L. using a datum velocity of 10,000'/sec. Weathering corrections were applied where the base of shot did not penetrate the weathering layer.

The data was played back digitally with 3-fold stacked sections produced on variable density film. The data during processing was all filtered to remove the interfering events such as noise and ground roll. Multiple energy on the sections didn't appear to be a problem so that deconvolution was not necessary.

Results and Interpretation

The results and interpretation of Party 13's shooting are incorporated with the results of the Teledyne Parties 16 and 18 in the final portion of this report.

Statistical Data

Stage II - Teledyne Exploration Ltd. Party 16

Dates - The move to the Fort Providence area was completed January 7, 1970. Recording commenced on January 9 and was completed with the equipment being released on February 17, 1970.

Production - 95 miles, 1120 shot points, average daily production was 4.3 miles. The crew was in the area for 33 days, however some of this time was spent on "off-permit" shooting. They had seven down-days due to instrument problems in the recorder.

Equipment - Recorder, 2 shooting trucks, 2 cable trucks, 2 survey trucks, 1 party manager vehicle, 2 water trucks, 6 shot hole drills, 3 bulldozers (2 - 7E's and 1 - 6C), 1 personnel carrier. The IOE Aztec aircraft was used for supervisory trips.

Supplies were brought in by truck. Twenty-four trace digital recording equipment was used (S.D.S. 10-10).

Personnel - Party manager, operator and assistant, shooter and assistant, 2 surveyors, 2 rodmen, 5 line helpers, 8 drillers, 8 drill helpers, 2 water truck drivers, 6 dozer operators, 1 dozer foreman, dozer camp cook, seismic camp cook, cook's helper and camp attendant.

Surveying - Horizontal angles measured to + or - 20 seconds with a Wilde T-16 Theodolite. Horizontal control based on baseline survey. Vertical control based on baseline and previous seismic control.

#### Field Procedures

A 300% C.D.P. of shooting was used. Single holes were used, spaced 440 feet apart, stations spaced 110 feet apart with 8 geophones over 110 feet. Charge sizes varied from 2½ to 20 pounds of "Geogel" per hole. The average hole depth was 40 feet. Drilling was from fair to good.

#### Data Processing

All of the seismograms were corrected to a datum of +1500' A.S.L. using a datum velocity of 10,000'/sec. Weathering corrections were applied where the base of shot did not reach the base of the weathered layer.

The data was played back digitally with 3-fold stacked sections produced on variable density film. All the data was filtered with selective filters used to remove low frequency interference energy. The data was not deconvolved since multiple interference did not appear to be a problem. The processing was done in Imperial Oil's Process Centre.

#### Results and Interpretation

The results and interpretation of Party 16's shooting are incorporated with that of Party 13's and Party 18's in the final portion of this report.

#### Statistical Data

Stage II - Teledyne Exploration Ltd. Party 18.

Dates - The move to the Fort Providence area was completed January 6, 1970. Recording began January 7, and was completed April 12, 1970. The vehicles were released on April 13, 1970.

Production - 386 miles, 4600 shot points, average daily production was 5.1 miles. The crew spent 75 shooting days on these permits. However, some "off-permit" was done in the area as well that is not included in this report. Two days of shooting were lost due to instrument failure in the recorder. The crew was also on time-off for 5 days in February.

Equipment - Recorder, 2 shooting trucks, 2 cable trucks, 2 survey trucks, one party manager pick-up truck, one water truck, 8 shot hole drills, one personnel carrier and 3 bulldozers (2 - 7E's, 1 - 6C). IOE Aircraft Aztec was used for supervisory trips. Digital recording equipment (S.D.S. 10-10) was used. Supplies were brought in by truck.

Personnel - Party manager, operator and assistant, shooter and assistant, 2 surveyors, 2 rodmen, 5 helpers, 8 drillers, 8 drill helpers, 2 water truck drivers, 6 dozer operators, 1 dozer foreman, dozer camp cook, seismic camp cook, cook's helper and camp attendant.

Surveying - Horizontal angles measured + or - 20 seconds with a Wilde T-16 theodolite. Horizontal control based on baseline and previous seismic control.

Conditions - Weather was typical with temperatures ranging from 0° to -50°. Terrain was level but rough surface for travelling.

Field Procedures

A 300% C.D.P. method of shooting was used. Single holes were used, spaced 440 feet apart, stations were 110 feet apart with 8 geophones over 110 feet. The charge size varied from 2½ to 10 pounds of "Geogel" with most holes shot with 10 pounds. The average hole depth was 40 feet. The drilling was from fair to good.

Data Processing

All of the seismograms were corrected to a datum of +1500' A.S.L. using a datum velocity of 10,000'/sec. Weathering corrections were applied where the base of shot did not reach the base of the weathered layer.

The data was played back digitally with 3-fold stacked sections produced on variable density film. All the data was filtered with selective filters used to remove low frequency interference energy. The data was not deconvolved since multiple interference was not a problem. The processing was done in Imperial Oil's Process Centre.

Results and Interpretation

The quality of the seismograms obtained by the three crews were comparable and considered to be good to fair for this particular area. The only consistent reflection which could be carried was the Middle Devonian carbonate. A time structure map was constructed on this reflection. Because of the thin isopach between the Middle Devonian carbonate and the basement, a basement reflection could not

be carried. A shallow reflector somewhere above the Middle Devonian carbonate was sporadic and impossible to carry in those areas where the carbonate was very shallow. It was then not possible to construct any isochron maps. The interpretation of the Fort Providence area was made from this one structure map and the seismic cross sections. The seismic coverage in the area was tied into a velocity survey at the well 10E Providence A-47-61°30'-117°15' on the Yellowknife Highway.

Two major anomalies and one smaller anomaly were observed from the seismic coverage.

A discussion of these anomalies is as follows:

1) The first major anomaly, the Deep Bay Barrier Complex, is evident in the east-half of Permit 4193. The word barrier is used to infer that the Deep Bay anomaly is part of the Arrowhead Barrier which separates the Horn River shale basin in the north from the Muskeg evaporite basin of Northern Alberta. The name Arrowhead represents continuous carbonate from the top of the Middle Devonian Carbonate down to the Chinchaga and is equivalent to Keg River, Sulphur Point and Slave Point in time. The thickness of this total carbonate on the Deep Bay anomaly is approximately 800 feet; whereas, the thickness of the carbonate within the basin itself is 200 feet or less. The seismic coverage on the Deep Bay anomaly indicates a raised rim along the edge of the barrier. This raised rim we interpret as being a prospective feature for the trapping of hydrocarbons, considering that the regional dip in the area is towards the southwest.

2) The second major anomaly that was interpreted from the seismic coverage is a NE-SW trending fault with the downthrown side towards the northwest with a vertical displacement of approximately 200 feet. This fault can be observed on the maps running through Permits 4154, 4561, 4560, 4495 and 4494 from a point near the town of Fort Providence northeast to a point about a mile beyond the abandoned well IOE Providence E 45-61°40'-117°00'. It appears that structural closures may be occurring along the upthrown side of this fault. It is felt that the entire upthrown side of this fault could be prospective for the trapping of hydrocarbons if a cross fault or a roll-over were to occur in the north-easterly direction. The K-45 well is not a definitive test of this concept since it only penetrated a few feet of the Middle Devonian carbonate.

3) The third anomaly interpreted from the seismic control is felt to be a pinnacle reef of Middle Devonian age out in the Horn River Shale Basin in the northeast portion of Permit 4157. The relief on this pinnacle has been calculated from the seismic time map to be in the order of approximately 100 feet.

Several other minor relief anomalies were covered with detailed seismic but were then interpreted as being too low in relief to be economically prospective.

Several shallow events were observed on the seismic cross sections, particularly near the MacKenzie River. These shallow events appeared as in-filled troughs and have been interpreted as

Pleistocene channels infilled with sands and gravels and other low velocity material. The channels are not considered prospective, and are possibly old tributaries of the MacKenzie River.

Summary and Conclusions

It can be concluded at this time that there are three prospective anomalies in Imperial Oil's permit acreage in Fort Providence. Whether the economics of these prospects would warrant drilling at this time is questionable.

Please Note:

A report covering work done by Accurate Exploration Ltd., Party 47C in the Fort Providence area in 1967 was submitted by Mr. O. Friesen to the Department of Indian Affairs and Northern Development on March 21, 1968. See Department Code Number 7-6-4-66-11.

It has been found through the new surveying that the shot point locations on those accompanying maps for Party 47C were in error. These locations have since been re-positioned in their proper coordinates and appear in the correct location on the maps accompanying this present report.



O. Friesen  
Southern Exploration District Manager  
Imperial Oil Enterprises Ltd.  
Edmonton, Alberta



# LOG OF OUTCROP SECTION

STATION NO. 69-33  
WINDY MOUNTAIN

## WINDY MOUNTAIN

## WINDY MOUNTAIN

## FORMATIONS

**LOCATION:** LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE N.T.S. C-53  
SEC. LAT 65°50' LONG. 137°10'

**Description of location:**

ANTICLINE ON EAST BANK OF BLACKSTONE  
RIVER, 12 MILES SOUTH OF OGILVIE RIVER.

## ELFVATION

MEASURED: D. MURPHY, S. SWINDEN  
METHOD: Brunton, Jacob's Staff

TO ACCOMPANY REPORT

M. DEV.

BY: W. E. MROZCZAK  
DATE:

## LEGEND

Coal

Salt

### Anhydrite

## Dolomite

### Limestone

## 3. Massive Char

### **3.1. Conglomerate**

### Sondertypen

### Saltstone

Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			Note: An additional 350 ft. of overlying section was not described. Lithology is similar to that at the top of the measured section
		0	
		100	Limestone, micritic skeletal
		200	
		300	

Interbedded micrite and silty micrite

Limestone, skeletal, micritic, slightly  
argillaceous

Limestone, micritic

2 of

Limestone, micritic, with silty laminae

Limestone as above

Limestone, skeletal, micritic, silty  
Minor faults 1650'-1750'

Limestone, micritic, silty

305

Limestone, micritic, Argillaceous material  
as lumps or in seams and pockets, increasing  
in abundance down section

Limestone, micritic, Argillaceous material  
as lumps or in seams and pockets, increasing  
in abundance down section

Limestone, argillaceous, skeletal, interbedded  
with calcareous gray shale

4 of 4

Shale, calcareous, spilty

Limestone, skeletal, micritic. Some dolomitic  
grains.

LOG  
OF OUTCROP SECTION  
STATION NO. 69-34  
GUSTY SUMMIT

LOCATION: LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE N.T.S. M-77  
SEC. LAT 65° 40' LONG. 136° 15'

Description of location:

Measured on limb of anticline about 13 miles south-southeast of Pothole Lake and 12 miles west of Hungry Lake

ELEVATION: MEASURED: G. Staples, R. Landes  
METHOD: Brunton, Jacobs Staff

FORMATION

TO ACCOMPANY REPORT

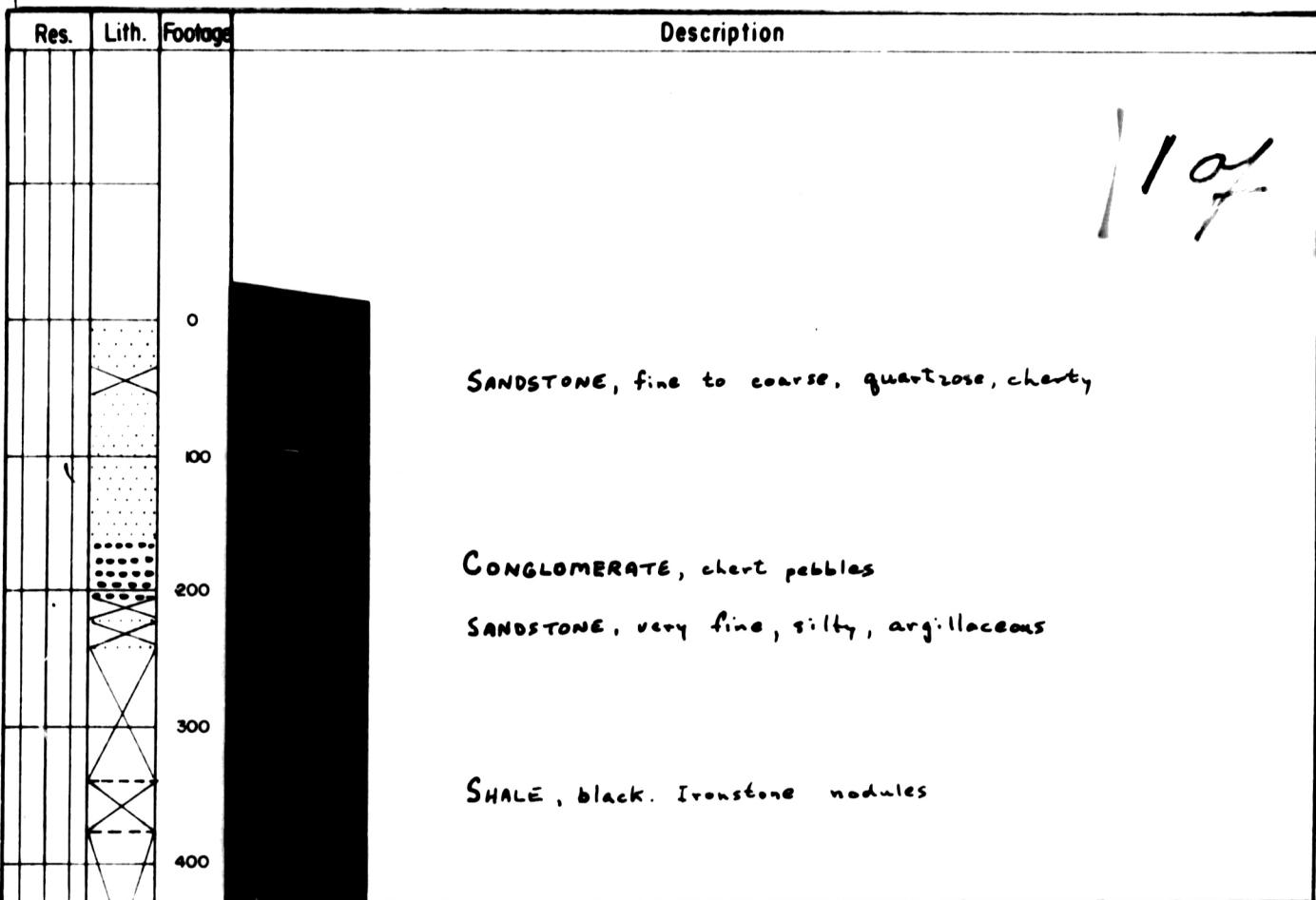
PERMO- PENN 2850'

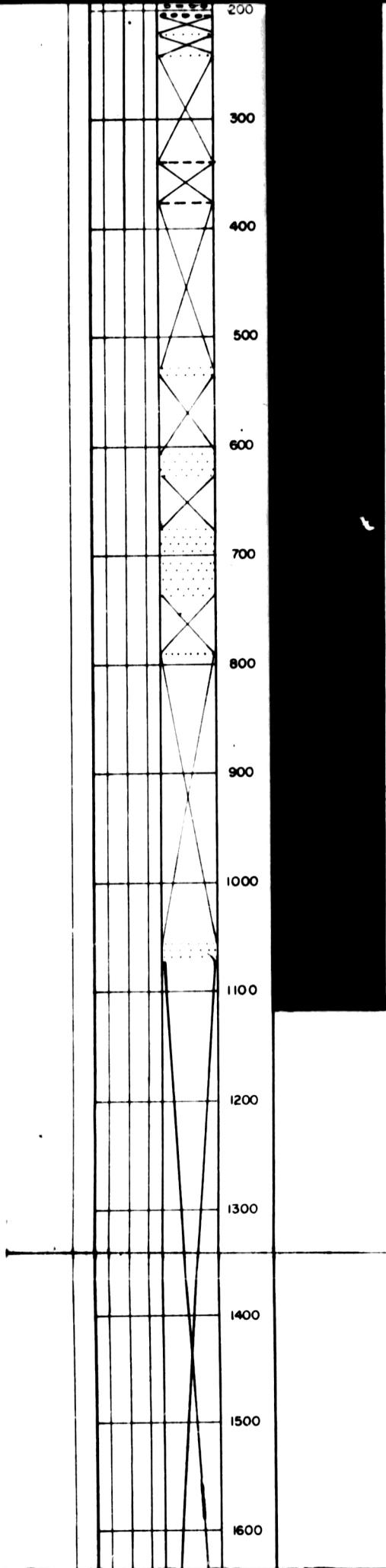
BY: W. E. MROSCZAK  
DATE:

LEGEND



IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION





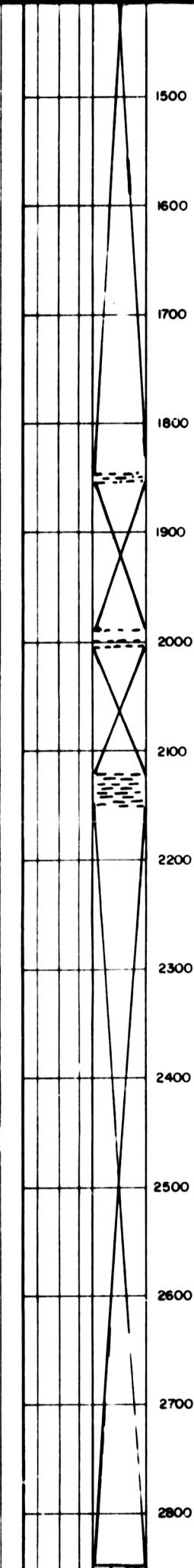
SANDSTONE, very fine, silty, argillaceous

SHALE, black. Ironstone nodules

Sandstone, very fine to silty, argillaceous, becomes  
coarser downward.

12 of

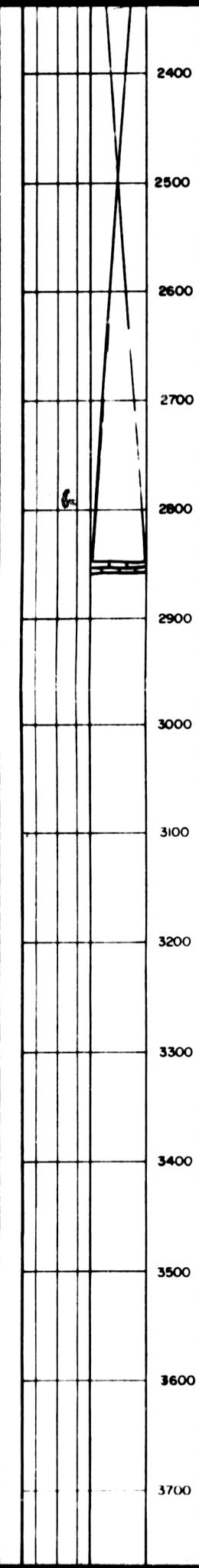
SANDSTONE, as above. Some siliceous shale interbeds.



SHALE, siliceous, silty

SHALE

305



474

LOG  
OF OUTCROP SECTION

STATION NO. 69-35  
WEATHER'S BREAK

FORMATION

PERMO - PENN 1220'

LOCATION: LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE N.T.S. 0-19  
SEC LAT 65° 40' LONG. 138° 30'

Description of location:

Measured from triangulation station (elev. 4210')  
on mountain 40 miles W-SW of junction  
of Blackstone and Ogilvie Rivers

ELEVATION MEASURED B. Petavello, G. Mosher  
METHOD Tape, Brunton, Jacob's staff

TO ACCOMPANY REPORT

BY: W. E. MROZCZAK

DATE:

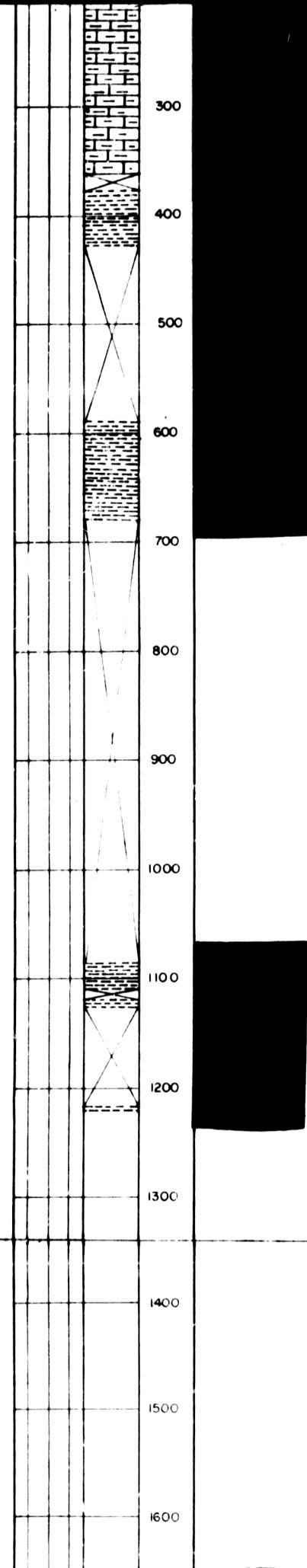
LEGEND

Coal	Salt	Anhydrite	Dolomite	Limestone	Massive Chert	Conglomerate	Sandstone	Siltstone	Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
		0	Limestone, micritic-skeletal, with some lithoclasts. Argillaceous near base
		100	Shale, calcareous, dark gray.
		200	Small fault
		300	Interbedded Limestone and Shale. Pyritic
		400	Shale, calcareous. Interbedded with minor

Interbedded Limestone and Shale. Pyritic



Shale, calcareous. Interbedded with minor  
argillaceous limestone.

12 of 2

LOG  
OF OUTCROP SECTION

STATION NO. 69-36  
MT. DEWDNEY

FORMATION

PERMO-PENN 3260'

LOCATION: LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE N.T.S. P-63  
SEC. LAT 66°10' LONG. 139°00'

Description of location:  
Measured east to west across Mt. Dewdney

ELEVATION

MEASURED: S. SWINSON, G. MOSHER  
METHOD: Tape, Brunton, Jacob's Staff

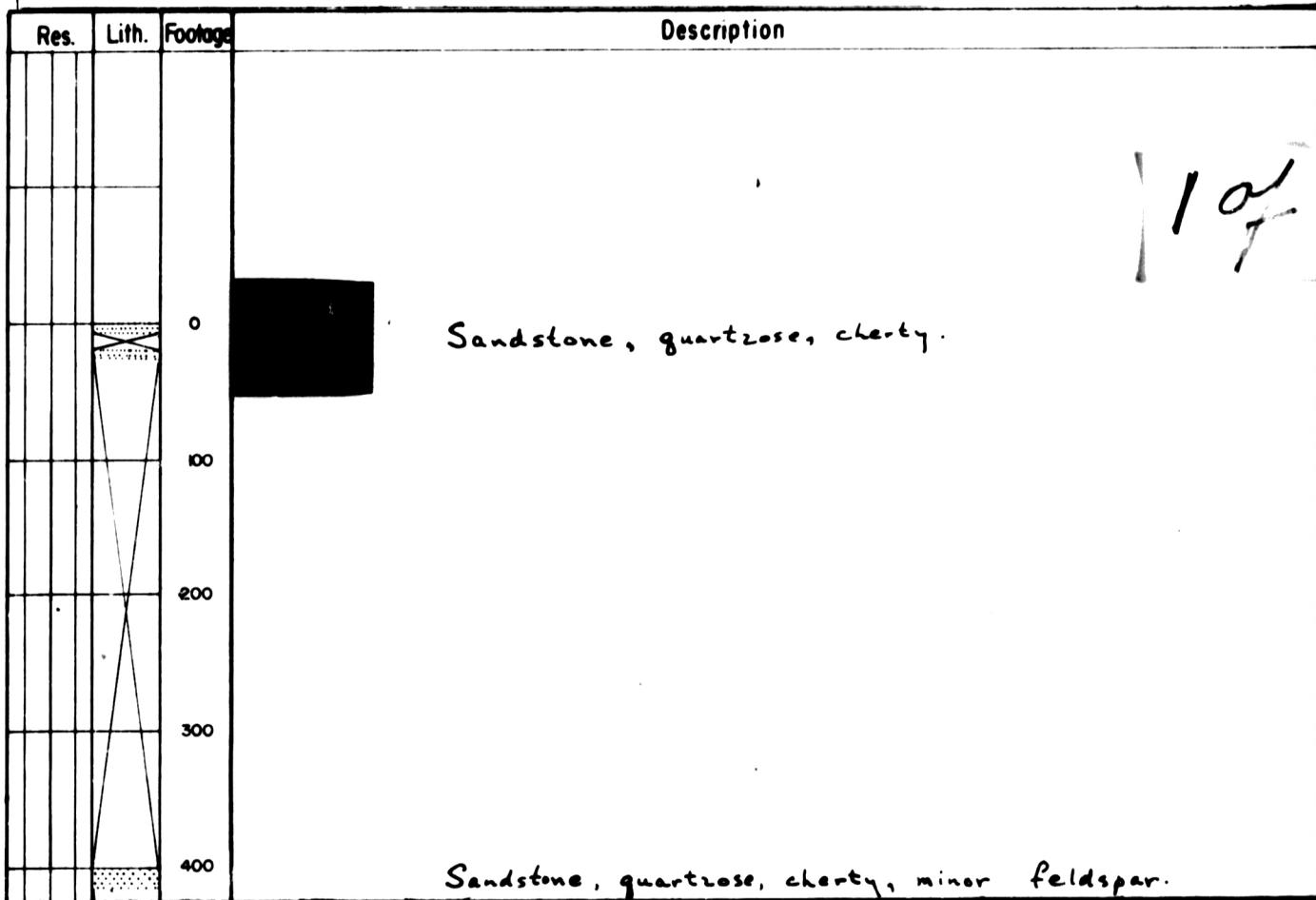
TO ACCOMPANY REPORT

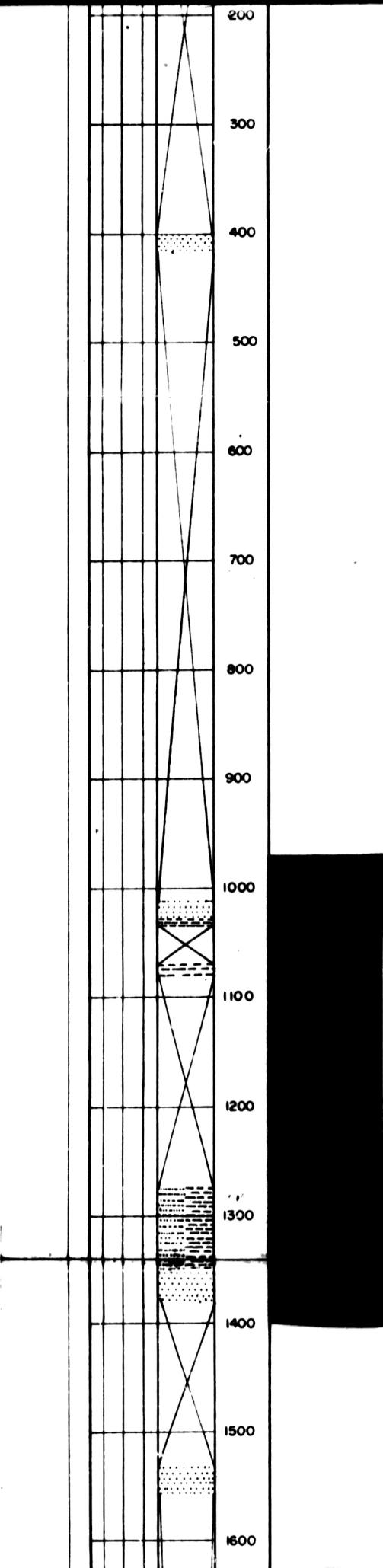
BY: W. E. MROZCZEAK  
DATE:

LEGEND

Coal	Salt	Anhydrite	Dolomite	Limestone	Massive Chert	Conglomerate	Sandstone	Siltstone	Shale
[Solid black box]	[Empty box]	[Empty box]	[Empty box]	[Brick pattern]	[Empty box]	[Empty box]	[Dotted pattern]	[Empty box]	[Hatched pattern]

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION





Sandstone, quartzose, cherty, minor feldspar.

2 of

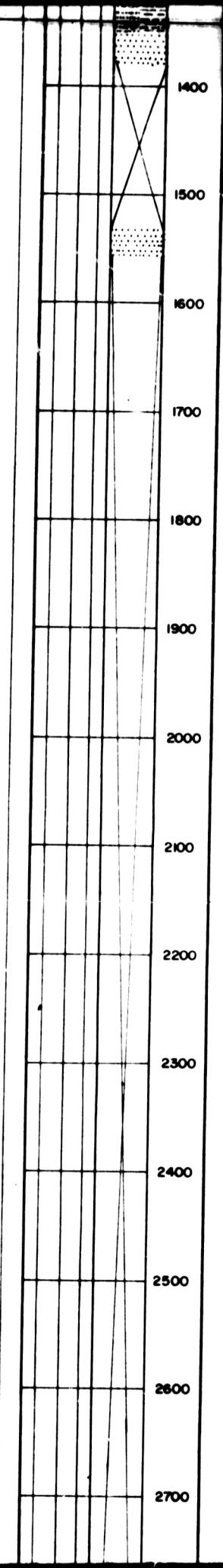
Sandstone, shaly. One lenticular conglomerate.

Silty shale

Sandstone, medium grained. Shale partings

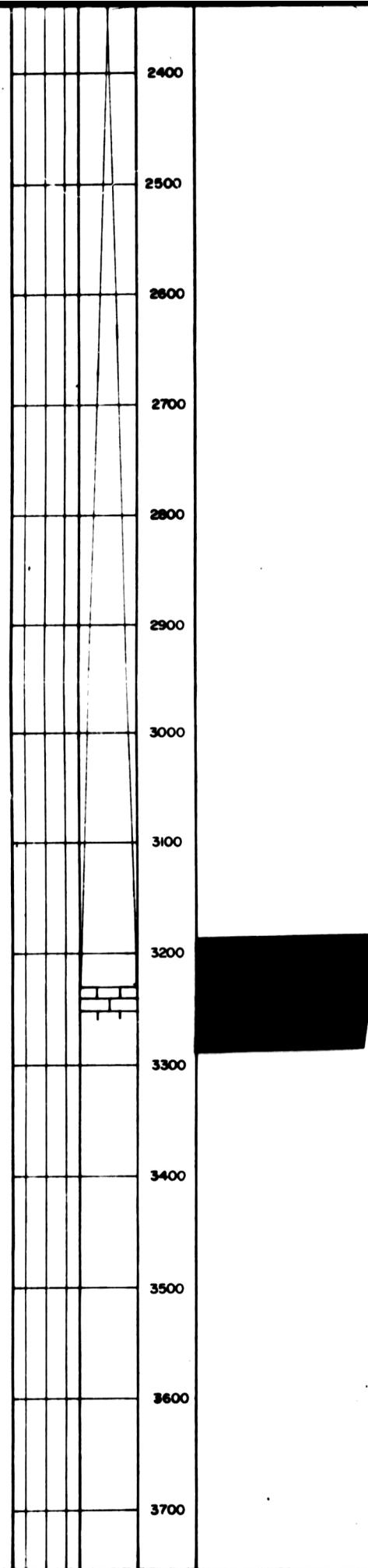
Silty sandstone with shale partings

Sandstone, medium grained. Shale partings



Silty sandstone with shale partings

305



Limestone, micritic, skeletal, slightly argillaceous

4 of 4

LOG  
OF OUTCROP SECTION  
STATION NO. 69-37  
WHITESTONE HIKE

**LOCATION:** LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE N.T.S. A-21  
SEC. LAT LONG. 66° 10' 138° 45'

### Description of location:

Measured across ridges about 12 miles east  
southeast of Mount Dewdney & 2.5 miles  
northwest of the Whitestone River  
ELEVATION: MEASURED: G. Staples, R. Landes  
METHOD: Brunton, Jacobs Staff.

## FORMATIONS

TO ACCOMPANY REPORT

PERMO-PENN. 1220'

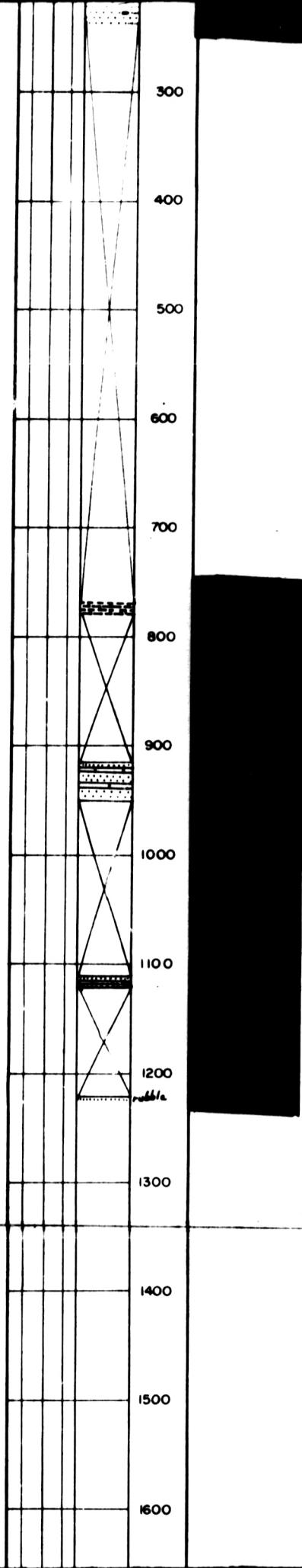
BY : W. E. MROZCZAK  
DATE :

## LEGEND

Coal      Salt      Anhydrite      Dolomite      Limestone      Massive Chert      Conglomerate      Sandstone      Siltstone      Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			10/1
		0	Limestone, micritic, high skeletal content at top and base.
		100	
		200	Conglomerate, chert pebble, glauconite Sandstone, chert, quartz, glauconite
		300	
		400	



Shale, calcareous. Interbeds micritic limestone.

Sandstone, quartzose, cherty. Micrite cement.  
Interbedded with micritic Limestone

Sandstone rubble, as above

2 of 2

LOG  
OF OUTCROP SECTION

STATION NO. 69-38  
FIRST RAPIDS

LOCATION: LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE NTS. K-20  
SEC LAT 68° 50' LONG. 136° 30'

Description of location:

FIRST RAPIDS OF THE PEEL RIVER

ELEVATION

MEASURED W. ZATURSKY, B. PETOVELLO  
METHOD Tape, Brunton, Jacobs  
Staff.

FORMATION

TO ACCOMPANY REPORT

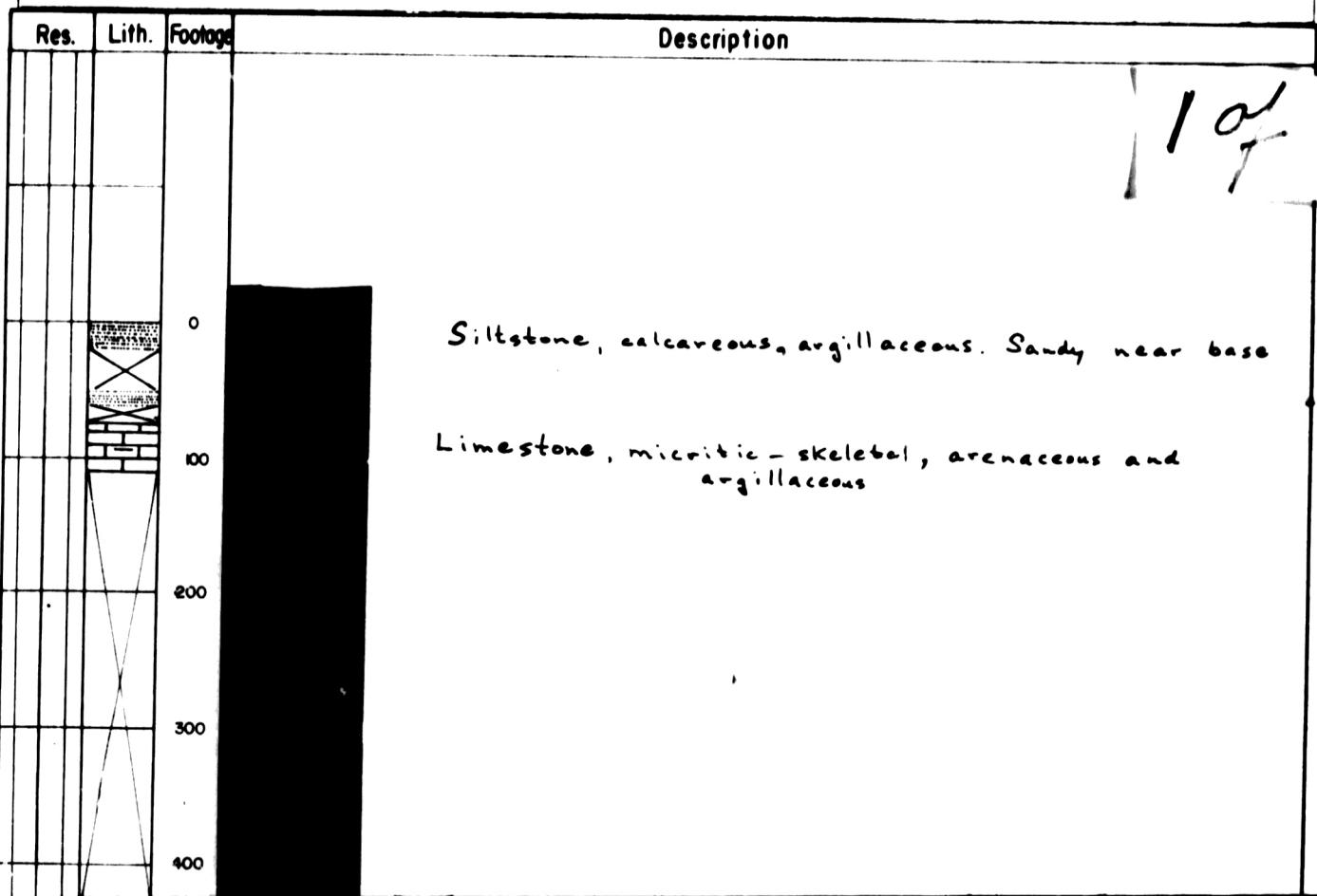
PERM. 900+

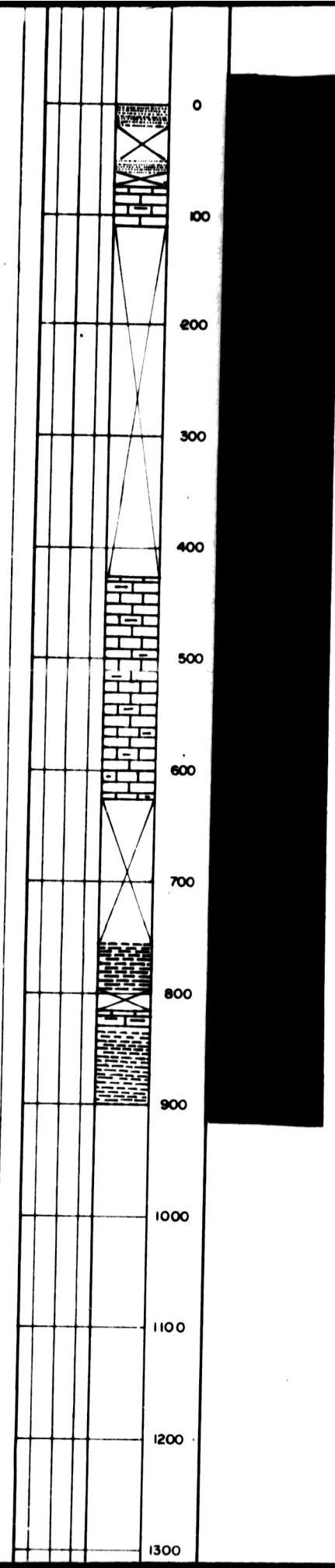
BY: W. E. MROZCZAK  
DATE:

LEGEND

Coal	Salt	Anhydrite	Dolomite	Limestone	Massive Chert	Concretionate	Sandstone	Siltstone	Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION





Siltstone, calcareous, argillaceous. Sandy near base

Limestone, micritic-skeletal, arenaceous and  
argillaceous

Limestone, micritic. Interbedded with silty shale.

Calcareous in an argillaceous matrix  
Shale, calcareous, dark gray

2 of 2

# LOG OF OUTCROP SECTION

STATION NO. 69-39

FOURTH RAPIDS CONTINUED

**LOCATION:** LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE N.T.S. B-34  
SEC. LAT 66° 00' LONG. 136° 00'

**Description of location:**

Continuation of lower part of PR2-61-11,12

## ELFVATION

MEASURED G. Mosher, S. Swindren  
METHOD Tape, Brunton, Jacobs  
Staff

## FORMATIONS

TO ACCOMPANY REPORT

PERMO-PENN 1685'  
M.D. DEV. (?) 715'

BY: LIE M805363AK

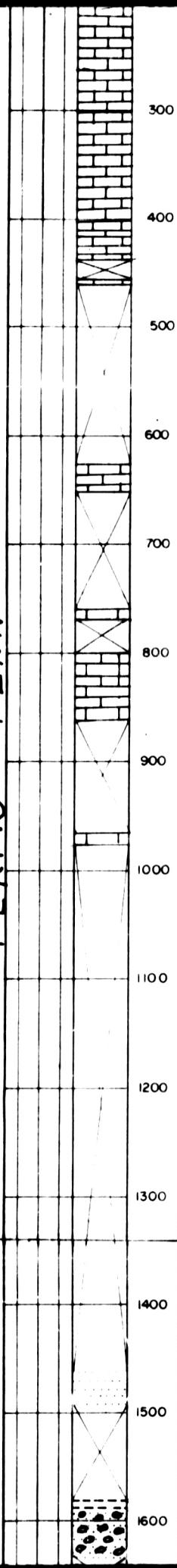
DATE:

## LEGEND

Coal      Salt      Anhydrite      Dolomite      Limestone      Massive Chert      Conglomerate      Sandstone      Siltstone      Shale

Res.	Lith.	Footage	Description
			1 of 7
		0	
		100	Limestone, micritic, cherty
		200	
		300	Limestone as above, up to 20% skeletal material
		400	

PERMO - PENN



Limestone as above, up to 20% skeletal material

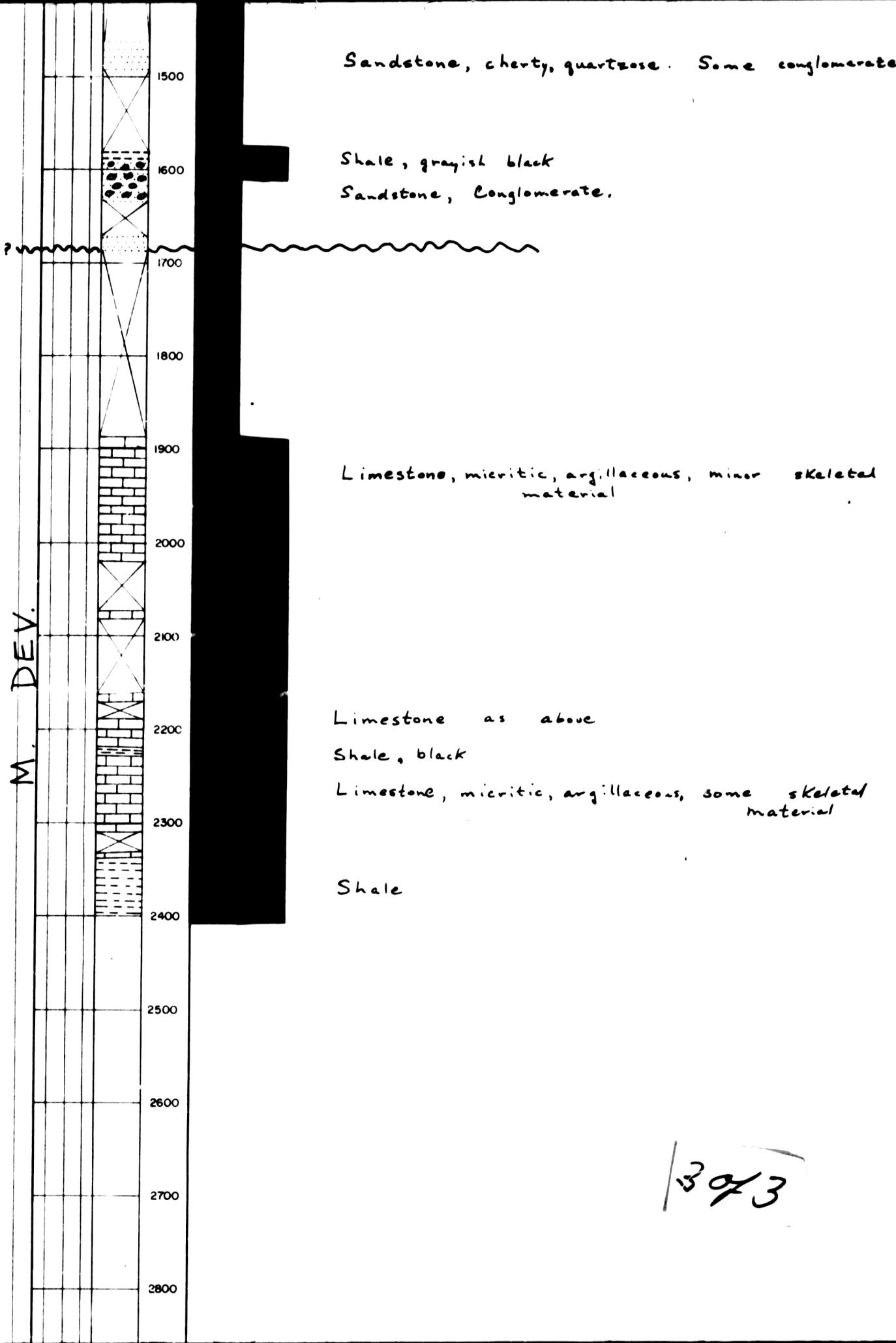
Limestone, micritic, argillaceous, cherty

12 of

Sandstone, cherty, quartzose. Some conglomerate

Shale, grayish black

Sandstone, Conglomerate.



LOG  
OF OUTCROP SECTION

STATION NO. 69-40  
EAST PORCUPINE JUNCTION

LOCATION: LSD. SEC. TWP. RGE. W. M.  
UNIT ZONE N.T.S. B-64  
SEC. LAT 66° 00' LONG. 138° 45'

Description of location:

NORTH BANK OF WHITESTONE RIVER AT  
ITS JUNCTION WITH EAST PORCUPINE  
RIVER

ELEVATION

MEASURED S. SWINDELL, G. MOSHER  
METHOD Tape, Brunton, Jacob's  
Staff

FORMATIONS

TO ACCOMPANY REPORT

PERMO-PENN. 670'

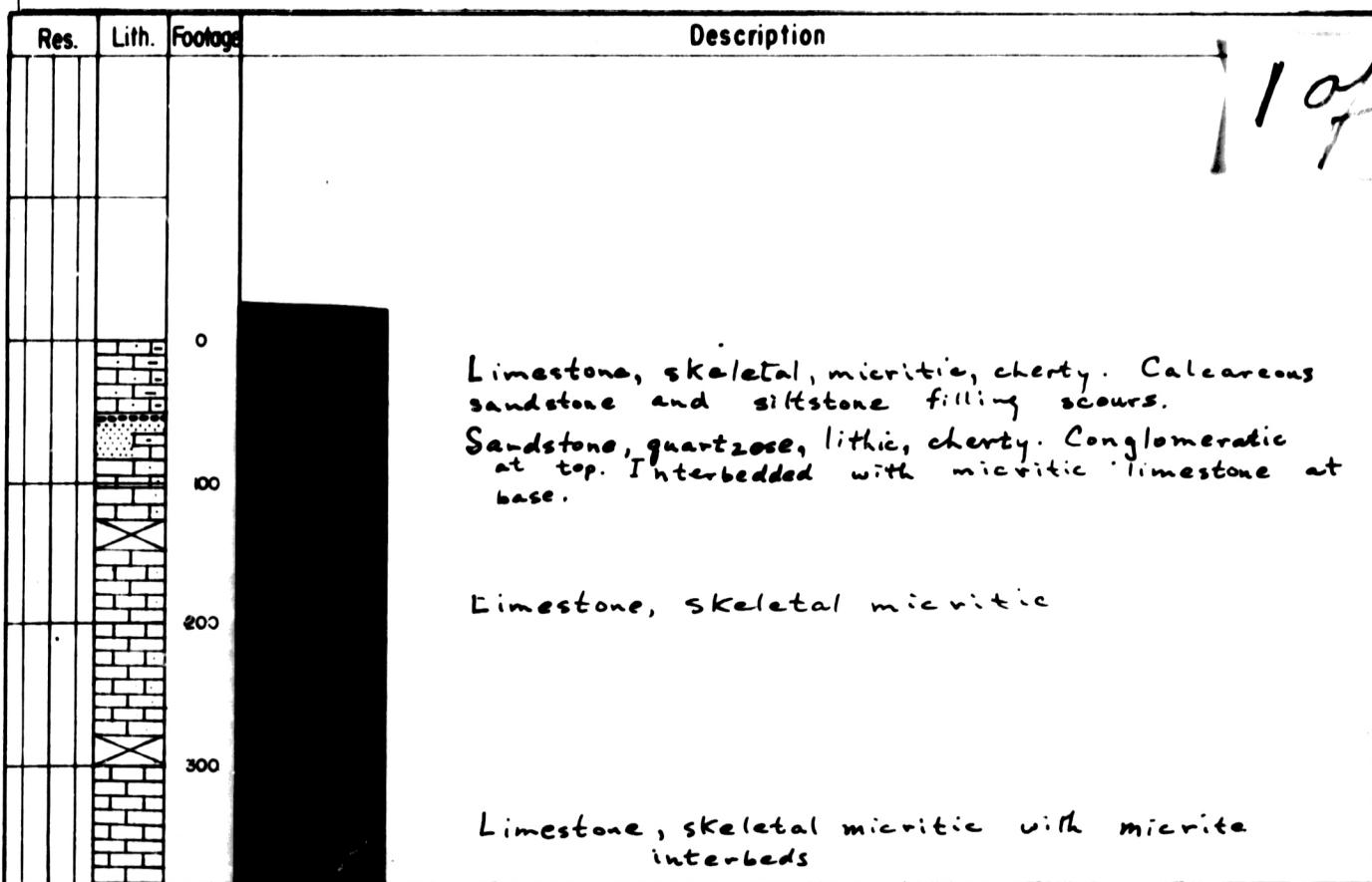
BY: W. E. MROSZCZAK

DATE:

LEGEND



IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION



IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
		0	Limestone, skeletal, micritic, cherty. Calcareous sandstone and siltstone filling scour.
		100	Sandstone, quartzose, lithic, cherty. Conglomeratic at top. Interbedded with micritic limestone at base.
		200	Limestone, skeletal micritic
		300	Limestone, skeletal micritic with micrite interbeds
		400	
		500	Limestone as above with argillaceous interbeds.
		600	
		700	
		800	
		900	
		1000	
		1100	

2 of 2

**LOG  
OF OUTCROP SECTION**

**STATION NO. 69-41  
CATHEDRAL FINALE**

**LOCATION:** LSD. SEC. TWP. R.R. W. M.  
UNIT ZONE N.T.S. **D 18**  
SEC. LAT 66° 10' LONG. 128° 45'

**Description of location:**

Measured along ridge and down slope  
at Cathedral Rocks, about 18.5 miles  
northeast of Mt. Dewdney.

ELEVATION

MEASURED: G. Staples, R. Landes  
METHOD: Brunton & Jacob's Staff

**FORMATION**

**TO ACCOMPANY REPORT**

PERMO - PENN. 1030'

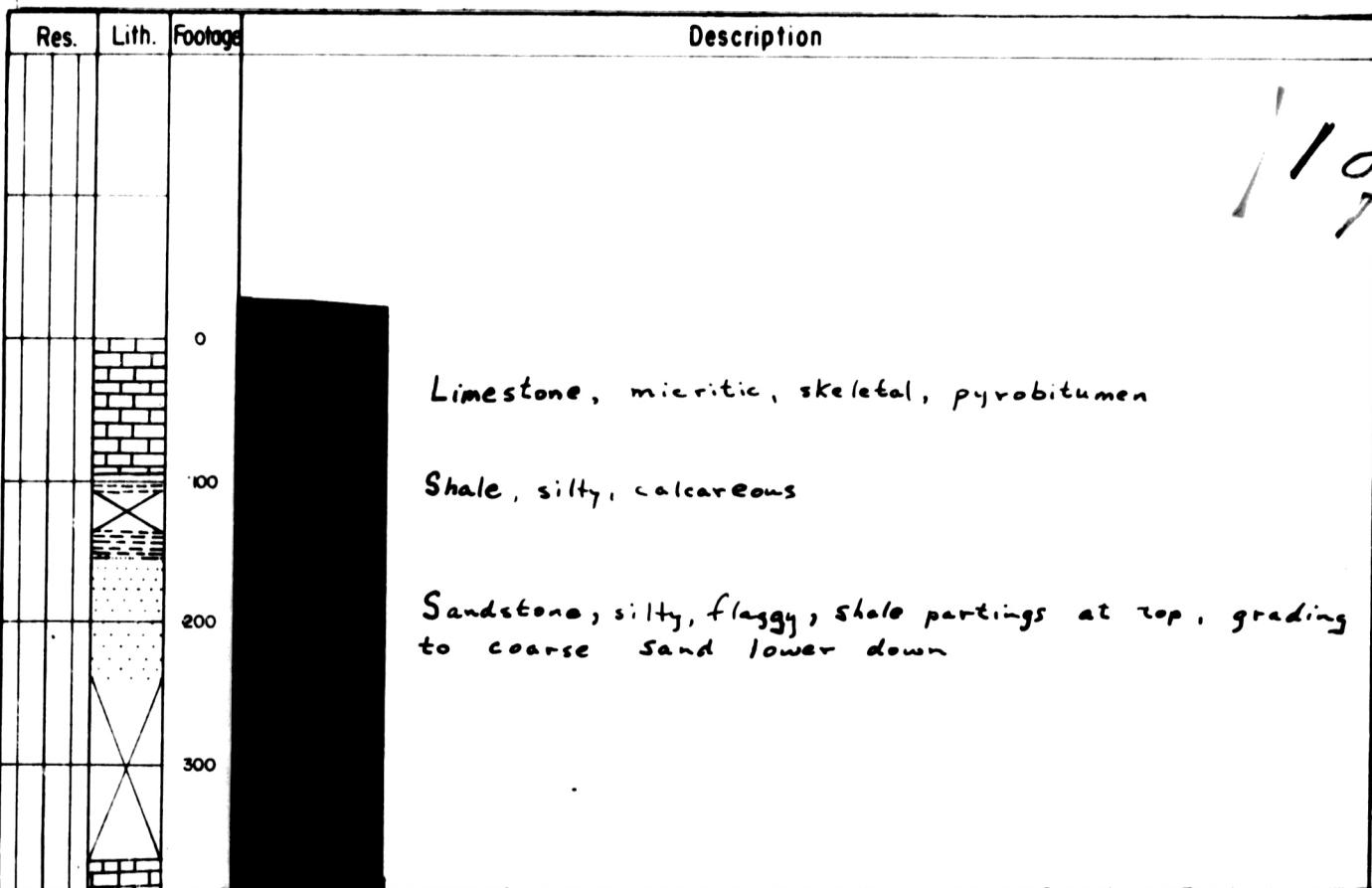
BY: W. E. MROZCZAK

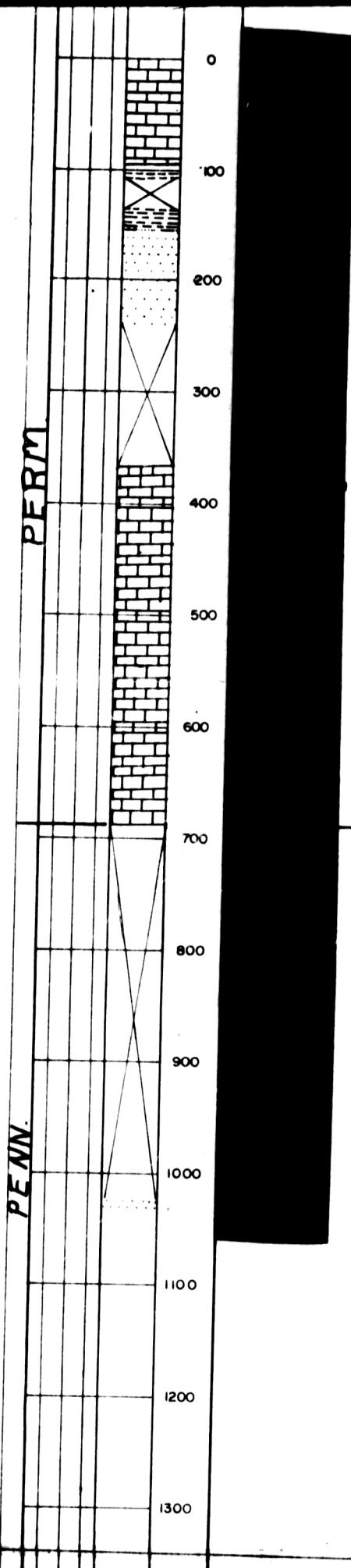
DATE:

**LEGEND**

Coal	Salt	Anhydrite	Dolomite	Limestone	Massive Chert	Conglomerate	Sandstone	Siltstone	Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION





Limestone, micritic, skeletal, pyrobitumen

Shale, silty, calcareous

Sandstone, silty, flaggy, Shale partings at top, grading to coarse Sand lower down

Limestone, micritic, argillaceous. Chert lenses locally

Top of Pennsylvanian

Sandstone, gltose, cherty

2 of 2

IMPERIAL OIL ENTERPRISES LTD.  
Producing Department - Western Region

Report on Reflection Seismic Programs  
Fort Providence N.W.T. Area

By: O. Friesen

November 26, 1970

Department Project No.: 7-6-4-69-10

7-6-4-89

IMPERIAL OIL ENTERPRISES LTD  
Producing Department - Western Region

Reflection Seismic Program

Fort Providence Area

Under agreement with Tenneco Oil & Minerals Ltd  
on Tenneco Permits 4488 and 4489

Field work performed by:

Teledyne Exploration Ltd. Party 16 from January 9  
to February 17, 1970  
and

Teledyne Exploration Ltd. Party 18 from January 7  
to April 12, 1970

IOE P.W.O. No: A080133

Department Code No: 7-6-4-69-10

by

O. Friesen

Southern Exploration District  
Edmonton, Alta

Date: November 26, 1970

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Enclosures:	(in attached pocket)
1. Shot Point Locations and Elevations map	
2. Middle Devonian Carbonate Structure map	

Introduction

This is a report on seismograph operations conducted by Teledyne Exploration Ltd. Parties 16 and 18 on behalf of Imperial Oil Enterprises Ltd. on Tenneco Oil and Minerals Ltd. permits 4488 and 4489 under option to Imperial Oil.

The seismic crews were in the general Fort Providence area from January to April 1970, however all of this time was not spent on these two permits only.

117°00'

116°45'

61°30'

4489



4488

FORT PROVIDENCE AREA

SCALE: 1:125,000

PAGE 2

Statistical Data

Teledyne Exploration Ltd. Party 16

Dates: The move to the Fort Providence area was completed January 7, 1970. Recording commenced on January 9 and was completed with the equipment released on February 17, 1970.

Production: 46 miles, 523 shot points, average daily production was 4.1 miles per day. The crew worked 11 days on these permits. Some down-time was experienced due to recording instrument problems.

Equipment: Recorder, 2 shooting trucks, 2 cable trucks, 2 survey trucks, 1 party manager vehicle, 2 water trucks, 6 shot hole drills, 3 bulldozers (2 7E's and 1 6C), 1 personnel carrier. The I.O.E. Aztec aircraft was used for supervisory trips.

Supplies were brought in by truck. Twenty-four trace digital recording equipment was used (SDS 10-10).

Personnel: Party manager, operator and assistant, shooter and assistant, 2 surveyors, 2 rodmen, 5 line helpers, 8 drillers, 8 drill helpers, 2 water truck drivers, 6 dozer operators, 1 dozer foreman, dozer camp cook, seismic camp cook, cook's helper and camp attendant.

Surveying: Horizontal angles measured to + or -20 seconds with a Wilde T16 theodolite. Horizontal control based on baseline survey. Vertical control based on baseline and previous seismic control.

Conditions: Temperatures varied from 0° to -50°

Field Procedures

A 300% C.D.P. method of shooting was used. Single holes were used, with shot hole spacing of 440', stations were spaced 110' apart with 8 geophones over 110'. Charge sizes varied from 2½ to 20 pounds of "Geogel" per hole. The average hole depth was 40 feet. Drilling was from fair to good.

Data Processing

All of the seismograms were corrected to a datum of +1500' A.S.L. using a datum velocity of 10,000'/sec. Weathering corrections were applied where the base of shot did not reach the base of the weathered layer.

The data was played back digitally with 3-fold stacked sections produced on variable density film. All the data was filtered with selective filters used to remove low frequency interference energy. Multiple interference did not seem to be a problem, therefore the data was not deconvolved. The processing was done in Imperial Oil's Process Centre.

Results and Interpretation

The results and interpretation of Party 16's shooting are incorporated with those of Party 18's in the final portion of this report.

Statistical Data

Teledyne Exploration Ltd. Party 18

Dates: The move to the Fort Providence area was completed January 6, 1970. Recording began January 7 and was completed April 12. The vehicles were released on April 13, 1970.

Production: 74 miles, 892 shot points, average daily production was 3.7 miles per day. The crew worked 18 days on these permits with no down-days.

Equipment: Recorder, 2 shooting trucks, 2 cable trucks, 2 survey trucks, one party manager vehicle, one water truck, 8 shot hole drills, one personnel carrier and 3 bulldozers (2 7E's and 1 6C). The I.O.E. Aircraft Aztec was used for supervisory trips. Digital recording equipment (S.D.S. 10-10) was used. Supplies were brought in by truck.

Personnel: Same number of personnel as shown for Party 16 on Page 3.

Surveying: Same techniques as described for Party 16 on Page 3.

Conditions: Same conditions as described for Party 16 on Page 4.

Field Procedures

Party 18 used the same field procedures as described for Party 16 on Page 4.

Data Processing

The data processing for Party 18 data was the same as described for Party 16 on Page 4.

### Results and Interpretation

The quality of the seismograms obtained by both crews were comparable and considered to be good to fair for this particular area. The only consistent reflection which could be carried was the Middle Devonian carbonate. A time structure map was constructed on this reflection. Because of the thin isopach between the Middle Devonian carbonate and the basement, a basement reflection could not be carried. On some lines a weak shallow reflection was observed but it was inconsistent and impossible to carry in those areas where the Middle Devonian carbonate was shallow. It was then not possible to construct any isochron maps. The interpretation of the Fort Providence area was made from this one structure map and the stacked seismic cross sections, with the assistance of geological control in the area. The seismic coverage was tied into a velocity survey on a well in the Fort Providence area.

As a result of the interpretation made from the new seismic coverage in this area, two distinct anomalies have become evident.

- 1) The first anomaly is the detailed configuration of the Arrowhead Barrier edge in the Deep Bay area. This edge is evident on the Middle Devonian carbonate time structure map. The edge has been outlined on the map in pale green and trending east-west along the northern boundary of Permit 4488. This barrier in the Deep Bay area represents continuous carbonate from the top of the Middle Devonian carbonate to the Chinchaga and is equivalent to Keg River, Sulphur Point and Slave Point in time. The thickness of this total carbonate at Deep Bay is approximately 800 feet; whereas, the

thickness of the carbonate within the Horn River basin itself is 200 feet or less.

As can be noted on the time structure map there is an apparent raised rim along the barrier edge. This rim could be considered prospective for the trapping of hydrocarbons if a "roll-over" of this raised rim occurred along the strike of the barrier edge.

2) The second observed anomaly is a NE-SW trending fault colored pink on the map. The downthrown side towards the southeast. In the basin area north of the barrier this fault shows throw of over 100 feet and the amount of throw appears to lessen as the fault progresses southwest over the barrier. There may be, however, enough displacement due to the fault at the rim of the barrier to cause the barrier rim to trap hydrocarbons considering the regional dip in the area is up towards the northeast.

#### Summary and Conclusions

In summary there has been 120 miles of 300% C.D.P. shot in permits 4488 and 4489. This shooting has been interpreted to show two anomalous features; namely, the Arrowhead Barrier edge in the Deep Bay area and a fault cutting across this barrier edge. The combination of both of these features could form a possible hydrocarbon trap on the rim of the barrier.



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