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REPORT ON THE
REFLECTION SEISMOGRAPH SURVEY IN THE
ARROWHEAD AREA
OF THE
NORTHWEST TERRITORIES

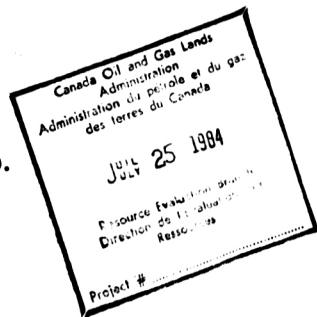
60°20' N to 60°40' N, 122°45' to 123°15'W

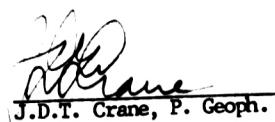
For

NSM RESOURCES LTD.

By

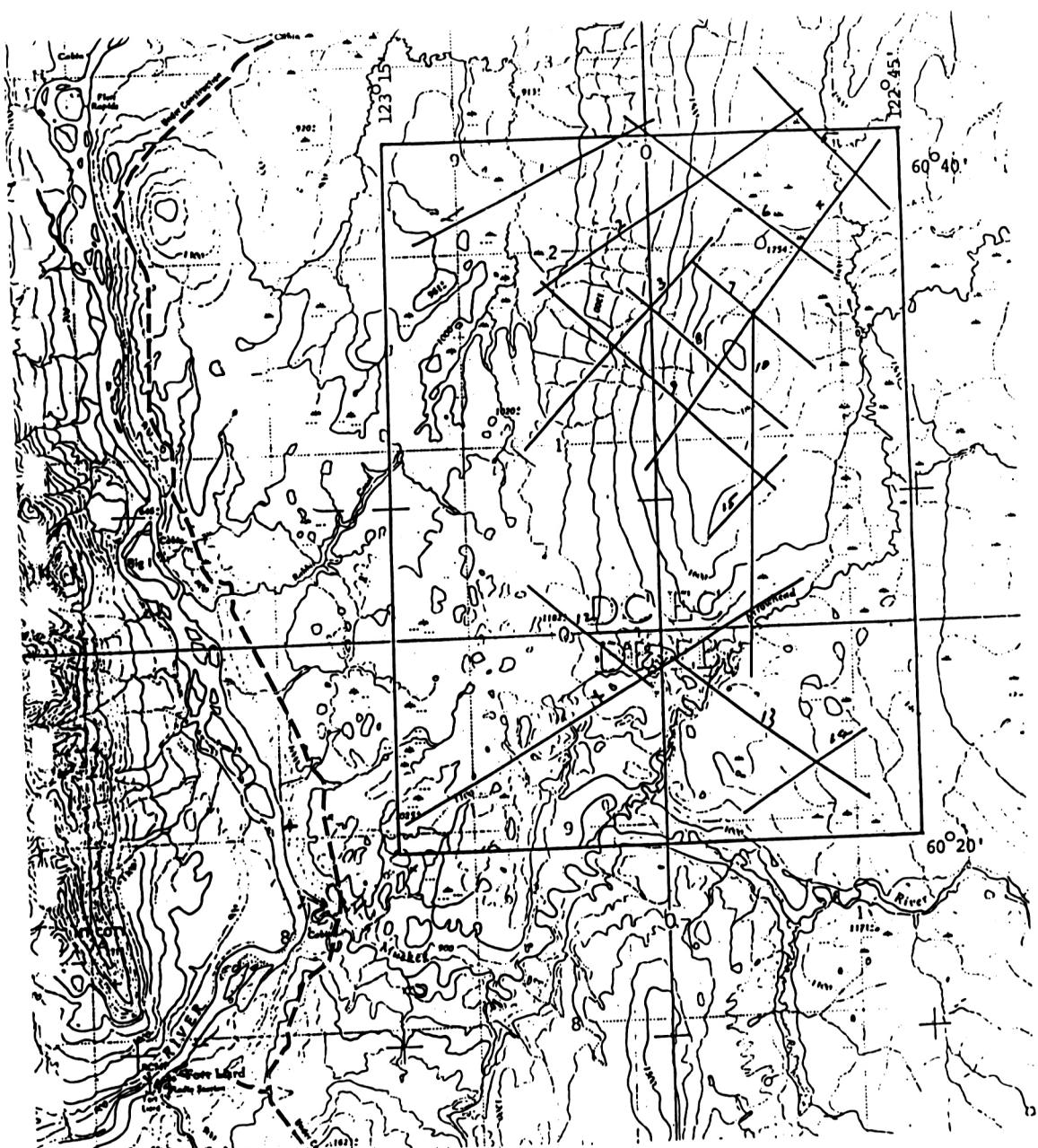
PETREL CONSULTANTS LTD.




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ARROWHEAD AREA
NORTHWEST TERRITORIES

- 1982 SEISMIC PROGRAM



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Introduction

The Arrowhead Project covers an area of approximately 100,000 hectares lying northeast of the confluence of the Liard and Petiot Rivers in the southwest corner of the Northwest Territories. The grid area of the project is contained between 60°20' N and 60°40' N latitudes and 122°45' W and 123°15' W longitude.

NSM Resources Ltd. obtained a farmout of this acreage from Texaco Canada Ltd. under a seismic option basis with continuing options to drill Middle Devonian tests. Existing seismic data was reviewed by Petrel Consultants Ltd. during 1981 and additional seismic data was shot by Kenting Geophysical Services Ltd. for NSM under Petrel's supervision. These data in conjunction with geological studies form the basis for an evaluation of this acreage.

Surface Conditions

Approximately 1200 feet of surface relief exists across the area. The lower areas, 850 to 1000 feet above sea level, are covered by muskeg or low velocity material; at the higher elevations, up to 2000 feet, high velocity material is present immediately below surface cover (velocity of 3700 to 4300 m/sec). Higher elevations are covered by scrub spruce and in some parts by poplar stands.

Data Base

Initial work in the area involved the evaluation of 500 miles (800 km) of seismic data (100% coverage) and 73 (117 km) miles of 600% data



provided by Texaco Canada (the farmor). The interpretations resulting from this evaluation were used to outline 200 km of seismic program (1200%) which was obtained from February 25, 1982 to March 19, 1982.

The 1982 data and the 117 km of Texaco 600% data form the basis for the present interpretation.

Regional Geology

The Arrowhead acreage overlies a segment of the Slave Point reef edge which is well known and tested extensively to the southeast through Celibeta, Petitot and well into British Columbia. This reef also extends northeast and east of Arrowhead through the Horn River area where fewer wells with lesser success have been drilled. Underlying the Slave Point a carbonate sequence of Middle Devonian formations is present while below this an untested Siluro-Ordovician section is indicated.

The Upper Devonian, Fort Simpson clastic section and Tetcho and Ketcho carbonates are about 4000 feet thick and are generally unprospective. Above this a Mississippian section with erosional subcrops of the Banff, Flett and Mattson members is present, thickening extensively to the southwest.

The regional dip of most horizons within the project area is to the southwest. This dip is modified across the area due to the presence of several features that have existed or been activated since Precambrian time.



The area lies on a northern extension of the Bovie Lake fault system which coupled with the Laramide Orogeny might explain the large increase in dip to the west, in the western part of the project area.

The Liard high and the Celibeta high are approximately 15 miles north and 15 miles southeast of the project area respectively. These features either present or reactivated since Precambrian time modify regional dip to the north and to the southeast.

The main target for hydrocarbon accumulation is considered to be the Slave Point reef edge and its associated porosity. The back reef facies is generally tight however this carbonate and the underlying Keg River carbonates may be prospective near fault zones where secondary dolomitization is anticipated. The third target is the erosional Mississippian top and the Mattson in particular.

Interpretation

Seismic events were identified on the new records using synthetic seismograms and sonic logs from the Texaco Arrowhead B-76 and N-2 wells. In Appendix A is a print of part of seismic section 82-13 adjacent to the B-76 well compared to the synthetic seismogram constructed from the sonic for that well. An equally good tie was obtained for data near the N-2 well. The following seismic events were carried and interpreted over the project area:

Paleozoic surface	- blue
Tetcho	- orange
Slave Point	- yellow
Chinchaga	- green



The following maps were prepared from the interpreted data:

Slave Point Structure (with faulting)
Tetcho - Slave Point Isochron (with faulting)
Tetcho - Chinchaga Isochron
Paleozoic - Tetcho Isochron

Work maps were also prepared over parts of the area on the following:

Tetcho Structure (with faulting)
Kotcho - Tetcho Isochron
Slave Point - Chinchaga Isochron

The Slave Point structure map indicates three main geologic features:

- 1) The band of steep west dips that traverse the project from north to south, just west of 123°00' West longitude.
- 2) The western limit of Slave Point reef edge development which traverses the project from SSW to NNE diagonally across the farmin block.
- 3) The fault zone which extends from the middle of the project at the north to the SSE.

The steep west dip is coincident with the limit of the Slave Point reef edge only in the middle of the project area from 60°29'N to 60°35'N latitude.

Southward the steep west dip is believed controlled by an extension of the Bovie fault system. To the north the fault zone (3), which extends to the NNW, becomes the controlling factor for this Slave Point dip.



Features of Interest and Drillable Locations

Three Middle Devonian features considered drillable have been located as described below:

1) Unit 69 in Block 60°40'N, 122°45'W

Seismic line 82-2, SP 337

This closed high structural feature is located on the Slave Point reef edge in an area untested to date. Reef porosity is anticipated along the edge trend. Secondary possibilities exist in the Mississippian but no specific Mississippian feature of interest is noted at this location.

2) Unit 49 of Block 60°30'N, 122°45' W

Seismic line 82-10, SP 489

A major fault system crosses this immediate area, as described above which is important for the dolomitization of the Keg River and Slave Point carbonate section and the development of the associated porosity. Together with this a good high structure is noted to the west, particularly on line 82-11 (SP 71) which is trending north-south. As noted on the Slave Point structure map this high extends to the north (of line 11) culminating in the highest point at the fault. We feel the combination of this ancient high together with more recent faulting creates a prospective area worthy of a test to the Middle Devonian.



3) Unit 76 of Block 60°40' N, 122°45' W

Seismic line 82-8 at intersection with 82-3

In this area both faulting and Slave Point reef edge anomalies are in coincidence. However, with the conflicting trends of these two and the positioning of the seismic lines a resolution of the optimum test site is not definite at this time. A seismic program is recommended (see below) but at the present time the best location appears to be in the southwest quadrant of unit 76. This could be a dual target in the Slave Point and Keg River.

Though features may be present on the Mattson additional control is required in the western part of the area before any location could be recommended.

Proposed Seismic Program

Two areas are recommended for additional detail and semi detail seismic programming as follows:

1) Southwest quadrant of Block 60°40' N, 122°45'

32 km program

This is a detail program over feature number three where faulting and reef edge anomalies are near coincidence. Four lines, NE-SW each 8 km long are positioned to evaluate about 14 units in this area.

2) South half of Block 60°30'N, 123°00' W

47 km program

In this area indications are that the Slave Point reef edge is trending towards the southwest. However, well control to the south of



the block shows that the trend must extend toward the southeast and a corner of this block could be prospective for Slave Point.

The quality of seismic data obtained using present field parameters is poor in this area but three lines are recommended to be shot in different directions (as shown) to resolve this potential prospect. The fourth line (NE-SW) overlies an off-reef facies but is included in an effort to gain control for the Mississippian (Mattson) only and is of lower priority.

Conclusions

The Arrowhead acreage is considered favourable for Slave Point and Keg River hydrocarbon prospects and two locations are recommended for drilling without further seismic detailing. A third lead is interesting and detail seismic programming is recommended. These locations and programs are noted on the Slave Point structure and the Tetcho - Slave Point isochron maps.

300

SCHOLARLY PAPERS

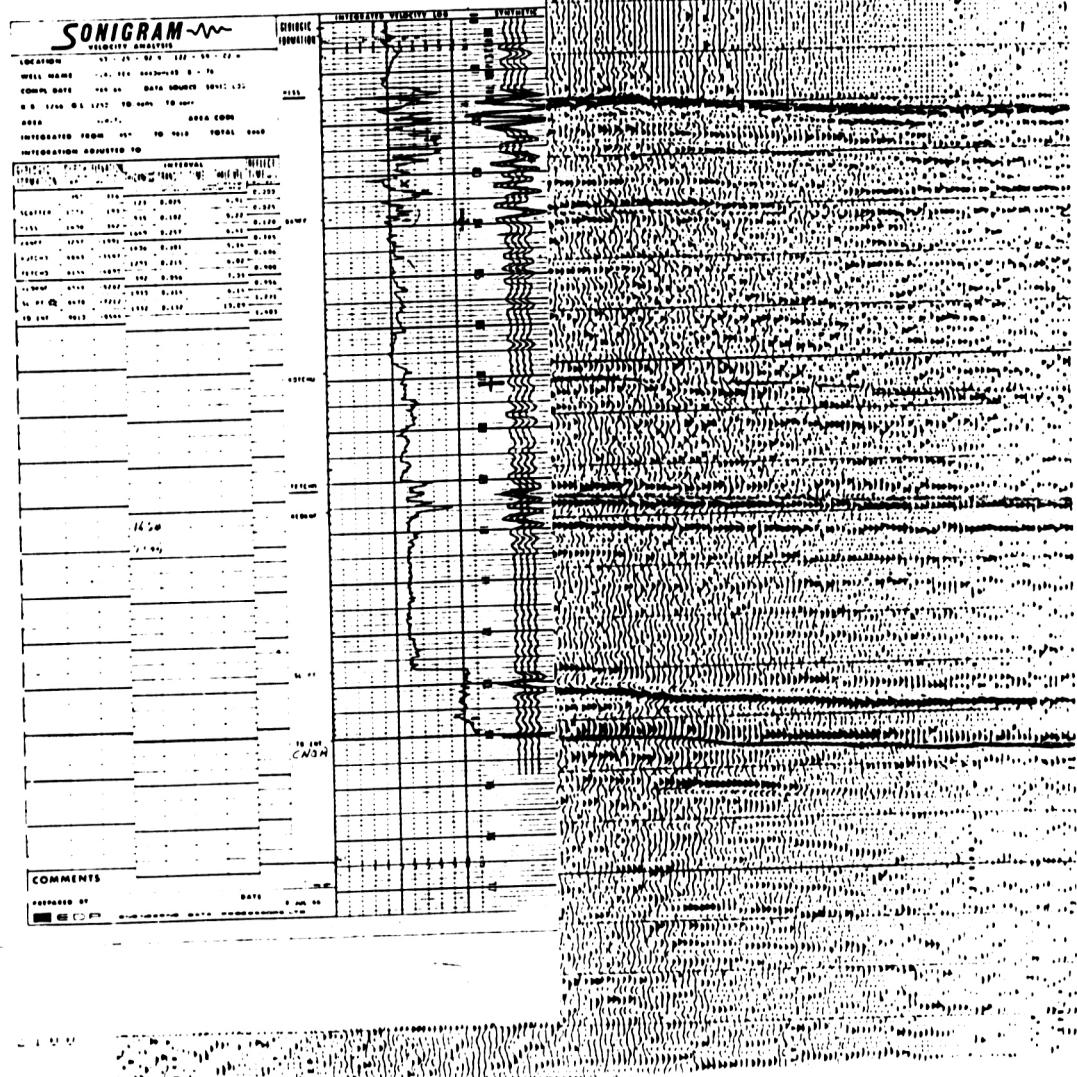
- Seismic line 82-13
- BA Texaco Arrowhead B-76 well

350

LINE 11
SP 254

LINE E
SP 523

A horizontal ruler scale with major tick marks every 100 units, ranging from 0 to 1000. A vertical line is drawn at the 457 mark, and a horizontal line extends from the 453 mark to the right.





APPENDIX A
FIELD PARAMETERS

Recording Arrowhead 1982

Sample Rate	2 ms
Record Length	5 sec.
Recording Filter	8 Lowcut 128 Highcut
Sub-surface Coverage	1200%
Number of Groups	96
Group Interval	33 m
Geophone Array	3.6 m spacing
Seismometers per Group	9
Shot Point Location	On station every fourth station
Spread	1584-33-0-33-1284
Holes per Location	1
Hole Depth	18 m
Dynamite Charge	2 kg



APPENDIX B

STATISTICAL DATA

Dates

Mobilization Date	February 22, 1982 - Recording
Start of Recording	February 25, 1982
Completion of Recording	March 19, 1982
Demobilization Date	March 22, 1982

PRODUCTION

Recording

Total operating days	23
Total recording days	23
Total moving days	0
Total weather days	0
Total testing days	0
Total down days	0
Production profiles shot	1624
Kilometers shot	208.2
Profiles per day	71
Kilometers per production day	9.05
Total days moving mob/demob	5



APPENDIX C

EQUIPMENT

Technical

Amplifiers	DFS V
Tape Systems	DFS V Seg. = B - 1600 BPI
Camera	SIE - ERC - 10
Remote Firing System	I.O. Firing System
Cables	Mark Universal - 1410' - 58' T.O.
Geophone Strings	250 Mark - L.15 14 Hz

Vehicles

- 1 Party Manager Unit
- 1 Recorder
- 1 Shooters Unit
- 3 Cable Trucks
- 1 Cable Truck added later March 2, 1982
- 3 Survey Trucks
- 4 Drilling Rigs (3 Top Drive - 1 Sewel)
- 1 Conventional
- 2 Water Trucks
- 1 Supply Truck



Camp - Drilling and Recording

- 1 Kitchen Diner
- 1 Utility
- 1 Office
- 1 Recreation Trailer
- 4 Sleepers
- 1 Shop
- 2 Fuel Sloops
- 1 Powder Magazine
- 1 Incinerator
- 2 50 kw Power Plants
- 4 500 gallon Propane Tanks

DOZER CREWS

Vehicles

- 1 D7G
- 1 D7F
- 3 D6D
- 1 Cat Push Truck