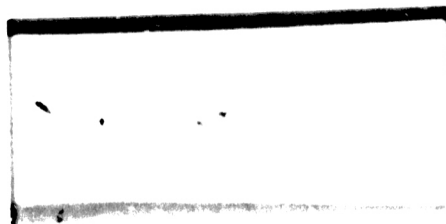


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**PETREL
CONSULTANTS
LTD.**

REPORT ON THE
REFLECTION SEISMOGRAPH SURVEY
LITTLE BEAR AREA
OF THE
NORTHWEST TERRITORIES

64°40' to 65°05' N, 125°30' to 127°00'W

For

NSM RESOURCES LTD.

by

PETREL CONSULTANTS LTD.

Land Use Permit N03B862
Cogla Project # 9229-N9-6E
August, 1983

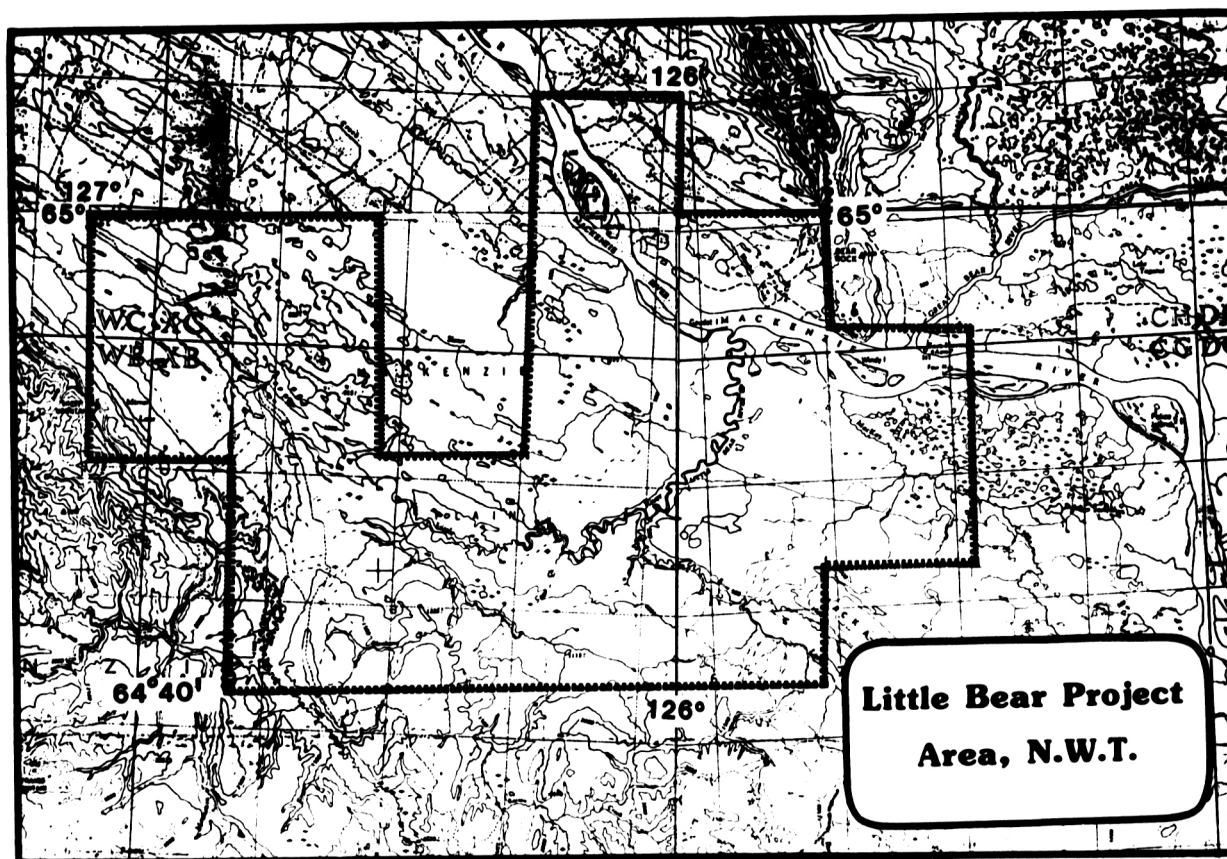
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September, 1985

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INTRODUCTION

The Little Bear Area lies on either side of the MacKenzie River near Fort Norman, N.W.T. It consists of 9.5 grid areas between $64^{\circ}40'$ and $65^{\circ}05'$ north latitude and $125^{\circ}30'$ and $127^{\circ}00'$ west longitude.

Previous seismic control in the area, a farmout from Amerada Minerals Corporation of Canada Ltd., consisted of 478 km of 400% and 600% shooting from Amerada and 497 km of 1200% seismic data obtained by NSM Resources Ltd. in 1983. This coverage along with 214.3 km of seismic data obtained from November 1984 to January, 1985 and in March and April, 1985 form the basis of this report.

Surface Conditions and Field Operations

The area surveyed is gently rolling, lightly timbered terrain cut by several deeply incised rivers running into the MacKenzie River.

Field parameters for the 1985 shooting are outlined in Appendix A, but basically consist of 1200% dynamite shooting using a 1608 metre split spread. Record quality was generally good except in the very eastern part of blocks $66^{\circ}50' N$, $125^{\circ}30' W$ and $67^{\circ}00' N$, $125^{\circ}30' W$. Also in the area around $66^{\circ}50' N$, $125^{\circ}45' W$ record quality was very poor.

Data Base

Data previously obtained formed a basic grid of coverage over the entire farmout block. Shooting in the 1984-1985 season was to confine leads outlined by that coverage. The recent coverage has delineated three

drillable prospects in the area.

Regional Geology

The Little Bear Area lies on the MacKenzie Plain between the Franklin Mountains to the east and the MacKenzie Mountains and Redstone Arch to the west. Overlying the thick Proterozoic sediments is a sequence of Middle to Lower Cambrian marine shales and sandstones followed by the Upper Cambrian and Siluro-Ordovician evaporites, shales and carbonates. Above this is a Lower to Upper Devonian sequence of marine Carbonates and shales again overlain by Cretaceous clastics. A thin veneer of Eocene is present in some parts of the area. Approximately 4000 to 9000 feet of Phanerozoic sediments are present in the survey area.

During the Middle Devonian, reef growths (Kee Scarp) occurred in a wide band extending north and south from Norman Wells.

An active tectonic history is a feature of this area with five major unconformities being identified between the Proterozoic and late Cretaceous. A full sequence of the above formations is present under most of the area, but in the eastern part of the area, a thick Cretaceous section directly overlies the Middle Cambrian section. A generalized stratigraphic section is given in Figure 1, (modified from Gilbert, D.L.F., pp.212-244, C.S.P.G. Memoir, #1, Future Petroleum Provinces of Canada).

Hydrocarbon reservoirs are believed present in Cretaceous sands; in any Kee Scarp reef developments; in porous Hume and Bear Rock carbonates

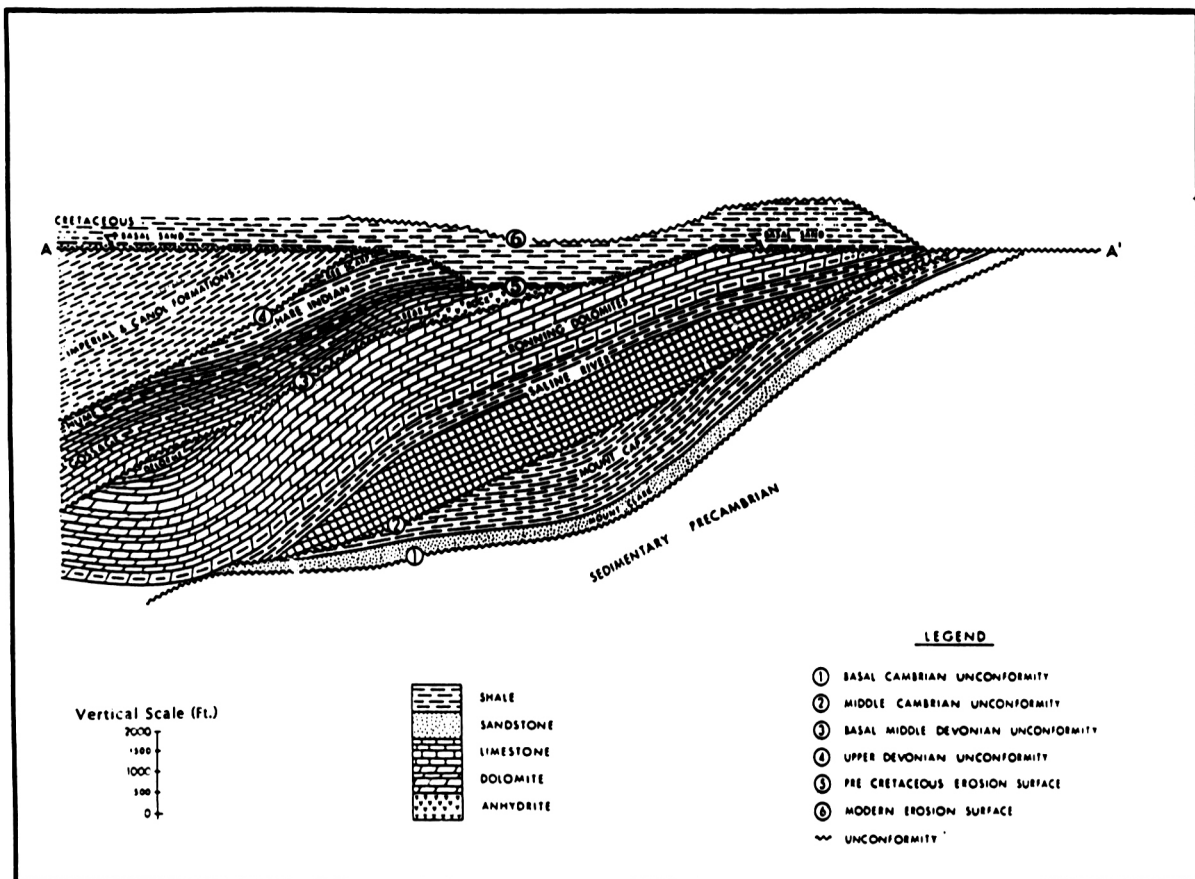


Fig. 1 Diagrammatic stratigraphic Section A-A' across Little Bear Project Area

and in the Ronning Group. Some potential for basal Cambrian Mt. Clark sands exists, although these sands have not been tested within the project area. Several tests in the area have found oil shows or positive geologic conditions for oil reservoir development. The Bluefish A-37 well, block 65° 00' N, 125° 45' W, recorded an Upper Devonian Kee Scarp platform development. The East Mackay B-45 test, block 64° 50' N, 125° 30' W, tested an 1800 foot column of oil from the Ordovician Ronning; the NSM Mirror O-33 well, 65° 00' N, 126° 45' W, encountered live oil in Cretaceous sands at a depth of 150 - 200 feet, as well as porous, reservoir quality rock at the Hume and Ronning levels. The NSM Windy Island A-53 test, block 65° 00' N, 125° 30' W, found three well developed porosity zones in the Bear Rock and Ronning dolomites.

Interpretation

Seismic reflectors were identified using sonic logs and synthetic seismograms at all available tests in the area. The following reflectors were correlated over the area wherever possible:

Upper Cretaceous Sand	- yellow (Eastern portion only)
Basal Cretaceous Unconformity	- brown
Canol	- red
Hume (First Carbonate)	- green
Bear Rock	- dark blue
Saline River	- yellow
Mt. Cap	- brown
Proterozoic	- red
Within Proterozoic	- light blue

Maps prepared using the above correlations are:

- Upper Cretaceous Sand Structure in Time (eastern portion only)
- Basal Cretaceous Unconformity Structure in Time
- Hume (First Carbonate) Structure in Time
- Basal Cretaceous to Hume Isochron
- Hume to Proterozoic Isochron

The Hume (First Carbonate) and the Basal Cretaceous events are the most reliable seismic events over the area. These two maps show the structural form that exists within the area at these two levels. The Base of Cretaceous - Hume isochron also serves to illustrate the three distinct geological provinces that exist within the project area.

Movement along the major sole fault was greater in the vicinity of the Norman Range than at the Mackay Range by approximately 7 km. The zone of tearing, shown in a NE-SW direction was active during Cretaceous and Tertiary time. This fault zone lies within geologic region A, one of three distinct geological regions in the area:

- A. Geologic region A lies west of the major thrust fault, A-A. A full section of Cretaceous overlies the Upper Devonian with a full section to Basement.
- B. Region B includes the portion of the Keele river uplift. This ancient high exposed Silurian (Ronning) rocks which are now covered by Cretaceous sediments. The East Mackay and Windy Island tests were drilled in this region.

C. Region C is an enclosed basin between the Keele uplift and the A-A thrust fault. In this area a wedge of Devonian rocks overlies the Silurian and are covered by Cretaceous. No test wells have been drilled in region C.

Well developed and drillable prospects have been delineated in each of these regions.

Features of Interest

Three major features of interest are the result of the delineation of prospects by the control obtained this season:

In geologic region A, the Blueberry Creek feature located in units 53, 43, 33 and S/2 24, 34, block 65° 50' N, 126° 15' W, shows 50 ms or approximately 250 feet of closure at the Hume level. The closure is also evidenced on the Basal Cretaceous Unconformity structure map, where it exhibits approximately 40 ms of closure over the area. The occurrence of reservoir quality rock at the Hume level and the presence of live Cretaceous oil at the NSM Mirror Lake test indicate this feature to be a most drillable prospect.

In geologic region C a well developed Hume anomaly exists on the flank of the old mid-Devonian high. This feature, located in the units 56, 57 in block 64° 50' N, 125° 30' W, is supported by pronounced thinning in the Base of Cretaceous to Hume Isochron.

In geologic unit B, where bituminous Cretaceous shales and sands directly overlie porous Bear Rock and Ronning carbonates, a northward extension of the feature tested by the East MacKay B-45 well is of interest. The feature is high structurally and is supported by a Cretaceous to Hume/First Carbonate thin.

A fourth feature of note in region A is the anomaly located in units 26, 35 and 36, block 65° 50' N, 126° 00' W. This feature, controlled by faulting to the north and the major tear fault to the east, has approximately 100 ms of closure at the Hume level. The feature is also supported by pronounced thinning in the Basal Cretaceous to Hume isochron.

Other features of geologic interest include the Saline River salt basin edge, illustrated on the Hume to Proterozoic isochron map as a thick. In the Vermillion Ridge well (8 km north of Line 101) a 2215 foot section of salt interspersed with anhydrite is present. This section is thinning to the southwest and is believed to terminate as shown on the above map. The salt served as a zone for the sole thrust movement described above.

The reflections below the Proterozoic unconformity are good throughout most of the area, and indications are that an old high was present in a north-south direction west of the line (126°20'W) shown on the enclosed feature map. Although some effect is still noted on the Proterozoic surface the high was generally peneplaned by later erosion and has no economic interest at this time.

A striking series of reversals and dips, have been correlated on the migrated sections at the top of Mt. Cap (brown), particularly on Lines 110 and 112. These are believed spurious and have been investigated by processing the data in unmigrated form as well as over and under migration. These latter displays show a great series of diffractions originating in the salt section where the sole fault has spawned relief faults which have cut the high velocity anhydrite members. Most are believed out-of-the-plane of section and consequently the migration was ineffective and erroneous and these features are of no economic significance.

A basal Cretaceous Sand is associated with the basal Cretaceous unconformity in many areas as seen on the sections. The overlying clastics thicken to the west and southwest and appear to be sourced in that direction. Porosity in these sands has been noted in several wells in the area and the presence of live Cretaceous oil in these sands at the Mirror Lake test increases the prospective nature of these sands.

Conclusions and Recommendations

Three delineated prospects within the area should be tested by the drill:

1. Blueberry Creek Feature - units 53, 43, N/2 33, S/2 34, 24, block 64° 50' N, 126° 00' W. The initial test on this feature should be located at SP 249, line 139, 64° 42' 34" N, 126° 25' 44" W.
2. East Little Bear - E/2 56, E/2 57, E/2 58, block 64° 50' N, 125° 30' W. The initial test on this feature should be located at SP 465, line 114, 64° 47' 36" N, 125° 39' 57" W.

3. North Mackay - C/3 46, W/2 47, W/2 48, SW/4 49, block 64° 50' N, 125° 30' W. The test on this feature should be located at SP 01, line 130. 64° 45' 05" N, 125° 38' 19" W.

Any additional seismic program would be dependent on the successful completion and the information gained on any one of the above recommended tests.

APPENDIX A

FIELD PARAMETERS

Recording

Sample Rate	2 milli-seconds
Record Length	3 seconds
Recording Filter	12-128 Hz
Sub-surface Coverage	1200%
Number of Groups	96
Group Interval	33.5 metres
Geophone Array	9 at 3.7 metres
Seismometers per Group	9
Shot Point Location	134 metres
Spread	1608-33.5-0-33.5-1608 m
Holes per Location	1
Hole Depth	14 metres
Dynamite Charge	2 kilograms (single cap)

APPENDIX B
STATISTICAL DATA

Dates

Mobilization Date..... March 25, 1985
Start of Recording..... March 31, 1985
Completion of Recording..... April 6, 1985
Demobilization Date..... April 7, 1985

PRODUCTION

Recording

Total operating days..... 14 Camp (Mar.25 -
Apr.7)
Total recording days..... 7
Production profiles shot..... 498
Kilometres shot..... 65.974
Profiles per day..... 71.14
Kilometres per production day..... 9.40
Total days moving mob/demob..... 1

APPENDIX B
STATISTICAL DATA

Dates

Mobilization Date..... November 24, 1984
Start of Recording..... December 2, 1984
Completion of Recording..... January 6, 1985
Demobilization Date..... January 6, 1985

PRODUCTION

Recording

Total operating days..... 34 Camp (Mar.4 - Apr.14)
Total recording days..... 24
Production profiles shot..... 1381
Kilometres shot..... 170.113
Profiles per day..... 57.54
Kilometres per production day..... 7.09
Total days moving mob/demob..... 6

APPENDIX C
EQUIPMENT AND PERSONNEL

Technical

Amplifiers	Texas Instruments	DFS V
Tape Systems	Texas Instruments	DFS V
Oscillograph	Tektronic	465
Camera	S.I.E.	ERC-10C
Remote Firing System	Input-Output	Encoder/Decoder
Cables	Seismic Cable with 58 foot group interval 24 outlets per cable	1392
Geophone Strings	Mark Products Ltd.	Model LRS 1011 14 Hz
	710 OHM coil 9 at 3.7 metres Array	

Vehicles

<u>Number</u>	<u>Use</u>	<u>Type</u>
1	Recorder	Nodwell AT-150
1	Shooting Unit	Flextrack CF-60
2	Cable Units	Nodwell RN-110

<u>Number</u>	<u>Use</u>	<u>Type</u>
2	Survey Units	Flextrack CF-60 Alltrack AT-80
2	Drilling Units	Flextrack FN-110, Air/Water
2	Drilling Units	Flextrack FN-110, Top Drive
1	Powder Unit	Sleigh mounted
1	Water Unit	Nodwell RN-110
1	Shop Unit	Nodwell RN-110
1	Fuel Unit	Ford 8000

Camp - Drilling/Recording

2	Kitchen - Diner Units	Sleigh mounted
2	Utility Units	Sleigh mounted
2	Office-Units	Sleigh mounted
3	Sleepers	Sleigh mounted

DOZER CREWSVehicles

2	D7G Caterpillar Tractors	c/w winch
1	D7F Caterpillar Tractor	c/w winch

Camp

1	Kitchen-Diner	Sleigh mounted
1	Sleeper	Sleigh mounted
1	Power Plant	Sleigh mounted
1	Fuel Sloop (9000 gallon)	Sleigh mounted
3	Fuel Sloops (3000 gallon)	Sleigh mounted
1	Utility unit	Sleigh mounted

APPENDIX D

PROCESSING

Processing of seismic data was done by Petrel Consultants Ltd.

Processing Sequence

1. Demultiplex
2. Gather
3. Amplitude Recovery
4. Deconvolution - Spiking
 - 0.8 - 2.2 sec. gate
 - 72 millisecond operator
 - 5% pre-whitening
5. N.M.O.
6. Statics
7. Stack
8. Common Offset
9. R.N.M.O.
10. Automatic Residual Statics
11. Mute
12. 1200% Stack
13. Filter
14. Trace Equalization
15. Migration
16. Display

Both normal and reverse sections, migrated and unmigrated were displayed at 7.5 inches/second.

DOZERS

Borek Construction Ltd.
Dawson Creek, B.C.