

GREAT BEAR LAKE AREA, N.W.T.
Permits: 4990, 4991, 5246, 5247, 6387 &
Adjoining Crown Corridor

REPORT ON REFLECTION SEISMIC SURVEY

March 23, 1971 - April, 1971

By
ATLANTIC RICHFIELD CANADA LTD.

(Four Enclosures)

PROJECT NUMBER: 246-6-6-71-1

REPORT PREPARED BY
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Ltd.

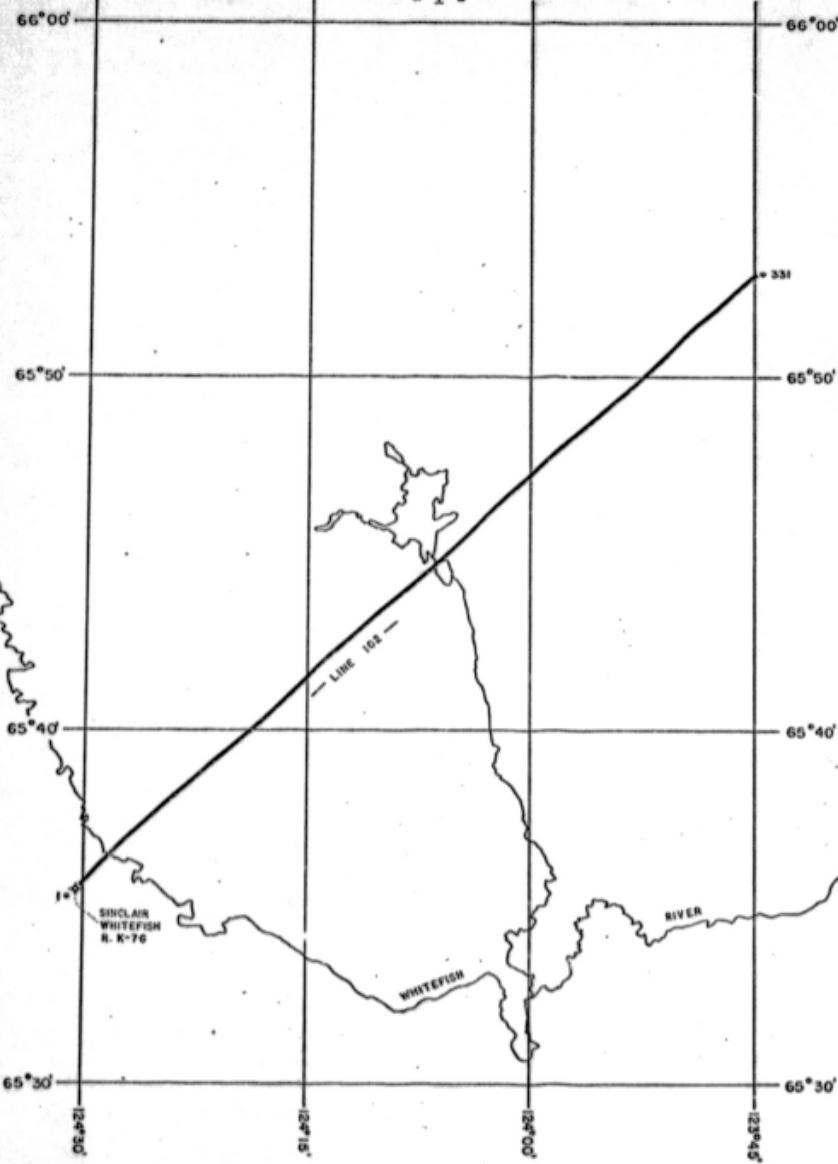
GEOPHYSICAL REPORT
ON THE
DYNAMITE SEISMIC SURVEY
OF THE
GREAT BEAR LAKE AREA, N.W.T.
FOR
ATLANTIC RICHFIELD CANADA LIMITED
BY
NORTHERN GEOPHYSICAL LTD. PARTY #3



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FOR
ATLANTIC RICHFIELD CANADA LTD.
BY
NORTHERN GEOPHYSICAL LTD. PARTY #3
MARCH 28, 1971 - APRIL 8, 1971
PERMIT NOS. 4990, 4991, 5246, 5247, 6387 &
Adjoining Crown Corridor
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DATE OF REPORT: July, 1971
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TABLE OF CONTENTS

	<u>Page</u>
LOCATION MAP	1
INTRODUCTION	2
FIELD OPERATIONS:	2
1. General Accessibility	2
a) Surface Conditions	2
b) Topography	2
c) Logistics	3
2. Surveying	3
3. Drilling	3
4. Recording	3
a) Equipment	4
b) Recording Parameters	4
5. Communications	4
6. Sub Contracted Equipment	4
MOBILIZATION AND RELEASE DATES	6
EQUIPMENT LIST	7
PERSONNEL	9
PRODUCTION STATISTICS	10
a) Drilling	10
b) Recording	10
DATA PROCESSING	10
RESULTS AND INTERPRETATION	12



INTRODUCTION

The seismic survey in the Great Bear Lake Area consisted of one line (Line 102) shot northeast from Latitude 65°35', Longitude 124°31' to Latitude 65°53', Longitude 123°45'. This area is west of Great Bear Lake and is approximately 100 miles northeast of Norman Wells, N.W.T.

The survey was conducted during the period March 28 to April 8, 1971, by Northern Geophysical Ltd., Party #3. Field operations were under the direction of Party Managers, R. Scott and R. Mullock and data processing was under the direction of Party Chief, M.F. Kyle. The crew was supervised for Northern Geophysical Ltd. by A.W. Dietz and for Atlantic Richfield Canada Ltd. by Geophysicist K. Brillon.

FIELD OPERATIONS

1. General Accessibility

a) Surface Conditions: The area is rolling muskeg with numerous swamps and lakes, sparsely covered with pine trees.

b) Topography: The area is drained by the Whitefish River and its tributaries.

Shot point elevations range from a maximum of 1052 feet above sea level at S.P. 118, to a minimum of 556 feet above sea level at S.P. 22.

c) Logistics: A fully equipped and self-propelled track camp was utilized by the crew and moved every 4 or 5 days to keep travel time at a minimum.

Parts and groceries were trucked from Calgary. A 1500 gallon fuel truck hauled fuel from Norman Wells to the crew. A Cessna 185 airplane was used for scouting and emergency supply support.

2. Surveying:

Surveying was carried out using a Wild Theodolite TIAE instrument. The only control point in the area was a dry and abandoned well - Sinclair Whitefish R.K.-76. Topographic maps and aerial photographs were used for horizontal control.

3. Drilling:

Difficult drilling was encountered over the entire area due mainly to rocks and boulders embedded in the clay. Single holes were drilled throughout the area. Five drills and one extra water truck were employed (see equipment list for complete breakdown).

4. Recording:

a) Equipment: Recording instrumentation was 24 trace Dresser SIE PT800 binary gain amplifiers with a PDR-89 9 - track, 32 channel tape system recording in SEGA format. Nine Mark L-10, 14 cycle geophones per trace at 20 foot intervals were employed.

A low cut filter of 16 cycles and a high cut alias filter of 125 cycles was used when recording. The alias filter is built into the system when recording a 2 millisecond sample rate.

b) Recording Parameters: The line was shot using a 12/12 split spread with a minimum distance of 320 feet and a maximum distance of 2080 feet. Coverage shot was 400% common depth point. Single shot holes were drilled 60 feet deep, 480 feet apart and loaded with a 10 pound Geogel charge.

5. Communications:

A single side band radio with a 5281.5 kilocycle frequency was used for communication with an expeditor in Norman Wells. Radio reception was sporadic but daily contact was possible. Citizen band radios were employed for intercrew communications.

6. Sub Contracted Equipment and Services:

Surveying was carried out by Felix Seismic Surveys Ltd. of Calgary.

The following drills and water trucks were contracted for this prospect:-

- a conventional wheel mounted drill and water truck from Paterson Drilling Company Ltd.
- a conventional wheel mounted drill and water truck from Seis-Test Drilling Ltd.

-- a wheel mounted air water combination drill; two top drive auger drills (one wheel mounted and one track mounted) and a 1600 gallon water truck were contracted from Satellite Drilling Ltd.

Two bulldozers, a D6C and a D7E, owned and operated by Bruce Rome Construction Ltd. were used for line cutting and clearing. One D7-17A bulldozer was contracted from Bain Bros. Construction Ltd. for use as a utility dozer.

MOBILIZATION AND RELEASE DATES

<u>Equipment Name & No.</u>	<u>Mobilization Date</u>	<u>Completion & Release Date</u>
Bruce Rome Cat #141	March 24, 1971	April 1, 1971
Bruce Rome Cat #146	March 24, 1971	April 1, 1971
Bain Bros. Cat #14	March 29, 1971	April 8, 1971
Felix Survey truck #107	March 24, 1971	April 6, 1971
Satellite Drill #1	March 28, 1971	March 31, 1971
Satellite Drill #2	March 28, 1971	April 7, 1971
Satellite Water Truck	March 28, 1971	April 7, 1971
Paterson Drill	March 28, 1971	April 7, 1971
Seisform Drill #283	March 28, 1971	April 7, 1971
Seis-Test Drill	March 28, 1971	April 7, 1971
Northern Drill #171	March 28, 1971	April 7, 1971
Northern P.M. Truck #2543	March 28, 1971	April 8, 1971
Northern Supply Truck #113	March 28, 1971	April 8, 1971
Northern Service Truck #41	March 28, 1971	April 8, 1971
Northern Fuel Sloop #144	March 28, 1971	April 8, 1971
Northern Recorder #1	March 30, 1971	April 8, 1971
Northern Reel Truck #108	March 30, 1971	April 8, 1971
Northern Reel Truck #174	March 30, 1971	April 8, 1971
Northern Reel Truck #2367	March 30, 1971	April 8, 1971
Northern Shooting Truck #107	March 30, 1971	April 8, 1971
Northern Line Cleanup #114	March 30, 1971	April 8, 1971

EQUIPMENT & LIST

<u>Name & No.</u>	<u>Use</u>	<u>Wheel or Track</u>	<u>Size</u>
Paterson	Conventional Drill	Wheel	1800 International
Paterson	Water Truck	Wheel	1800 International
Seistest	Conventional Drill	Wheel	600 3. Ton Dodge
Seistest	Water Truck	Wheel	600 3 Ton Dodge
Satellite #1	Top Drive Drill	Wheel	1800 International
Satellite #2	Top Drive Drill	Track	Nodwell RN 110
Satellite	Water Truck	Wheel	White Tandem
Satellite	Service Truck	Wheel	3/4 Ton International
Seisform #283	Air Drill	Wheel	F-800 Ford Tandem
Seisform	Service Truck	Wheel	3/4 Ton Ford
Felix 107	Survey Truck	4 Wheel Drive	3/4 Ton Ford
Northern #171	Air Drill	Track	Nodwell RN 110
Northern #1	Recorder	Track	Nodwell RN 110
Northern #108	Reel Truck	Wheel	1 Ton Ford
Northern #174	Reel Truck	Track	Nodwell RN 110
Northern #2367	Reel Truck	4 Wheel Drive	3/4 Ton Ford

EQUIPMENT & LIST - Cont'd

<u>Name & No.</u>	<u>Use</u>	<u>Wheel or Track</u>	<u>Size</u>
Northern #107	Shooting Truck	Wheel	1 Ton Ford
Northern #2543	Party Manager Truck	4 Wheel Drive	3/4 Ton Ford
Northern #113	Supply Truck	Wheel	3/4 Ton Ford
Northern #114	Lime Cleanup Truck	Wheel	3/4 Ton Ford
Northern #41	Service Truck	Track	Nodwell RN 110
Northern #144	Fuel Sloop	Wheel	Trailer
Bain	Fuel Truck	Wheel	3 Ton International with 1500 gal. fuel tank
Northern #111	Shop Trailer	Skids	
Northern #127	Sleeper Trailer	Wheels & Skids	
Northern #11	Office & sleeper trailer	Skids	
Northern #9	Kitchen Trailer	Track	Nodwell RN 110
Northern #10	Utility Trailer	Track	Nodwell RN 110

<u>Cats</u>	<u>Type</u>	<u>Hours</u>
Bruce Rome #141	D-6C	117
Bruce Rome #146	D-7E	117
Bain Bros. #14	D-7-17A	11
	TOTAL	<u>245</u>

Trailer - sleeper & kitchen

Cessna 185 airplane (on skis & wheels)

2 Snowmobiles - 1 Skidoo Alpine & 1 Skidoo Nordic

PERSONNEL

Supervisor - A. Dietz

Party Managers - R. Scott March 28 - April 3
- R. Mullock April 4 - April 8

Surveyor - B. MacBride

- 2 helpers

Observer - V. Krause

- 7 helpers

Camp Staff - clerk

- mechanic

- supply driver

- cook & helper

6 Drillers

& 6 helpers & 1 water truck driver

4 Cat "skimmers"

- foreman

- cook

1 line cleaner

PRODUCTION STATISTICS

a) Drilling:

Number of shot holes drilled:	322
Total footage drilled:	18,565'
Total field time:	585.0'
Total travel time:	141.0'
Total drill time:	.726.0
Average hole depth drilled:	57.66'
Footage drilled per 10 hour day/drill:	256

b) Recording:

No. of miles in survey	30.0
No. of shots	319
No. of shot points shot	314
Days worked	7
Total field hours	72.5
Total travel time	16.0
Total recording hours	88.5
No. of shot points per day	44.85
Sub surface coverage per day	4.3 miles
Days not recording 3 - 2 waiting on drills, 1 equipment failure	

DATA PROCESSING

The seismic data were processed through the following sequence:

1. Demultiplexing and gain recovery of field records.
2. Normal moveout application.

DATA PROCESSING - Cont'd

3. Structural statics generated and applied using:

1000' datum plane

10,000'/sec. replacement velocity

3,000'/sec. weathering velocity

4. Digital Bandpass Filter: 16/20 - 116/120 c.p.s.

5. Display on paper.

6. Flattening statics applied.

7. First Break Mutes applied.

8. Trace Gather.

9. Display on paper.

10. Statics applied to the trace gathered records.

11. Stacked.

12. Digital Bandpass Filter: 16/20 - 116/120 c.p.s.

13. Time Variant Data Dependent Scaling.

14. Statics applied to change the flattened stack into a structural stack.

15. Display of structural time section on film.

Northern Geophysical Ltd. was responsible for data preparation, parameter selection and general quality control. Processing was carried out through a block time arrangement with Digital Technology (Calgary) Ltd.

RESULTS AND INTERPRETATION

Maps have been included in the report of the only two mapable horizons (Encls. 1 & 2). The horizons were determined to be the base of the Cretaceous and the Cambrian from a velocity survey of the Whitefish well. The average velocity to the Basal Cretaceous was calculated to be 9,800 feet/sec. and to the Cambrian 12,500 feet/sec. An isochron map from the Basal Cretaceous to the Cambrian is also included (Encl. #3) with the interval velocity calculated as 19,800 feet/sec. The velocity calculations were made using a correctional velocity of 10,000 feet/sec. and a datum plane of 1,000 feet a.s.l. The time structure maps of the Basal Cretaceous and the Cambrian show evidence of minor flexures and also a regional dip to the southwest. The Basal Cretaceous to Cambrian isochron map indicates a fairly constant 0.260 sec. interval. This is contrary to an expected regional thinning of beds to the northeast toward the shield.

In conclusion, the minor flexures evident on the time structure maps may be an indication of folding with the axis running north-northwest paralleling the Franklin Mountains. This folding may be associated with low angle thrust faulting occurring to the west of the area. The fairly constant Basal Cretaceous to Cambrian isochron interval may be explained by a simultaneous thickening of the Ordovician and a thinning of the Devonian. The thinning of the Devonian is a regional phenomena while the Ordovician may thicken into a basin at the northeast end of the line. The Ordovician thickening and the Devonian

thinning are of approximately the same magnitude as is determined by an intermediate horizon occurring intermittently along the line thus producing a fairly constant isochron interval.

