

PROJECT ACTION SHEET

RESOURCE EVALUATION BRANCH

PROJECT NUMBER:....9229-110-4E.....

COMPANY:....NORTH C.R. ENERGY LTD.....

REPORT TITLE: KOPANEELEE-JACKSON REFLECTION PROGRAM

The following action has been taken:

Receipt acknowledged

Reports and maps date-stamped

Memo sent to Land Management

Reports for review list edited

Inventory sheet made

Mylar

REVIEW AND APPROVAL made by:

Joh O'Berton 85-08-29

COMMENTS:

PROGRAM NUMBER: 9229-N10-4E

YEAR: 1983-84

Filed under same Project Number _____ or _____

(a) WRITTEN REPORTS:

Front back { (1) Operations Report Number: 1
(2) Interpretation Reports Number: 1

(b) MAPS:

(1) Shotpoint Maps Number: 2
 $1:50,000$

(2) Interpretation Maps Number: 8

TIME STRUCTURAL MAPS (4)

DEPTH STRUCTURAL MAPS (3)

DEPTH SECTION KOT-1

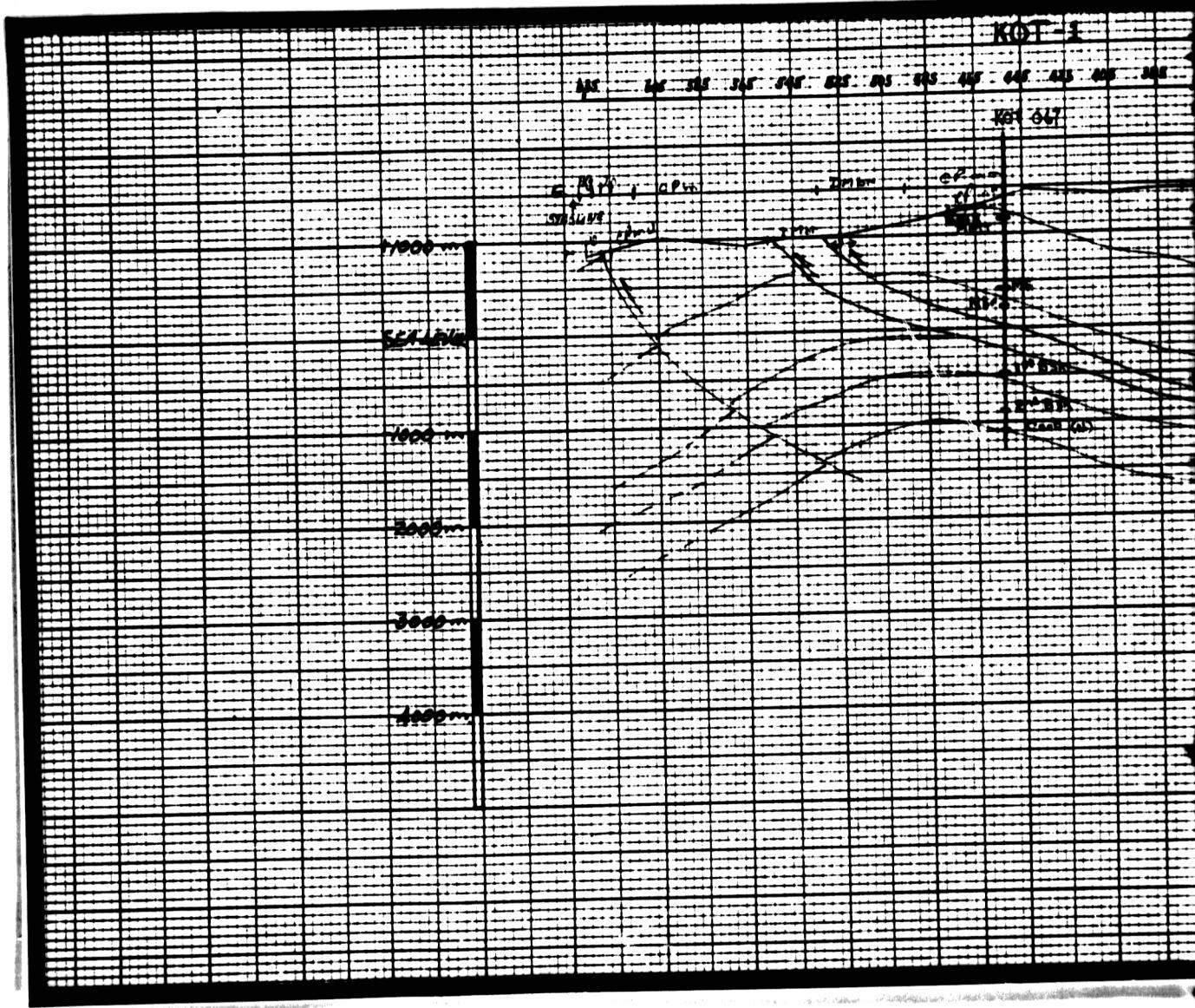
(3) Other Maps Number: _____

(c) SEISMIC SECTIONS

Number: 21 (Mirrored)

KOT-1 TO KOT-7

J-001 TO J-003



415 365 345 325 305 305 285 265 245 225 205 185 165 145 125

卷之三

PS 7X61 1150A 1141

— 160 —

卷之三

卷之三

1000

卷之三

卷之三

卷之三

INTER
SCALE
DATUM

9229 - N10 - 4E

NORTHCOR ENERGY LTD.

KOTANEELEE

INTEGRATED GEOPHYSICAL - GEOLOGICAL CROSS SECTION

KOT-1

DEPTH SECTION EXAMPLE

INTERPRETED BY: A.T.L.

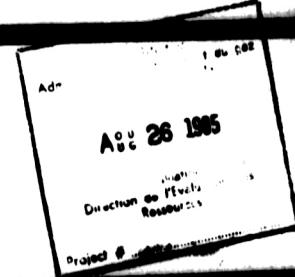
COMPILED BY: J.A.L.

SCALE:

DATE: SEPTEMBER, 1984

DATUM: SEA LEVEL

EMPRESS EXPLORATION CONSULTANTS





9229 - N10 - 4E

Geophysical Report

9229 - N10 - 4E

KOTANEELEE - JACKFISH N.W.T.
E.A. No. 167

KOTANEELEE-JACKFISH, N.W.T.

Lat: 60 deg. 10 min. to 61 deg. 00 min. N
Long: 124 deg. 00 min. to 124 deg. 37.5 min. W

Program Number	9229-N10-4E
Operator's Report Name	Northcor Kotaneelee-Jackfish Seismic Program 1983-84
Type of Survey	Reflection Seismic
Survey Locality	Northwest Territories
Year of Field Work	1983, 1984
Operator	Northcor Energy Ltd. Calgary, Alberta
Prime Contractor	Sefel Geophysical Ltd. Calgary, Alberta
Exploration Agreement	E.A. No. 167
Author of Report	Empress Exploration Consultants Calgary, Alberta
Date of Report	March, 1985
Commencement of Survey	June, 1983
Completion of Survey	February 25, 1984

TABLE OF CONTENTS AND ENCLOSURES

	Page
I. ABSTRACT.....	1
II. Locality Map.....	3
IIIA. Statistical Summary - Summer Portable Program..	4
IIIB. Statistical Summary - Winter Program.....	7
IV. Data Acquisition Equipment and Field Procedures	9
V. Description of Data Processing.....	11
VI. Synthetic Seismograms.....	13 & 14
VII. Discussion.....	15

ENCLOSURES

1. Seismic Shot Point Map
2. Seismic Sections: two pre-fold paper copies and
one film copy for Lines J001-J003,
KOT 1-KOT 7
3. Sample - Depth Section
4. Interpretive Maps: one pre-fold paper print of each

Time Structural Maps:

Base Cretaceous
Near Base Mattson
Near Top Nahanni

Depth Structural Maps:

Base Cretaceous
Near Base Mattson
Near Top Nahanni

I. ABSTRACT

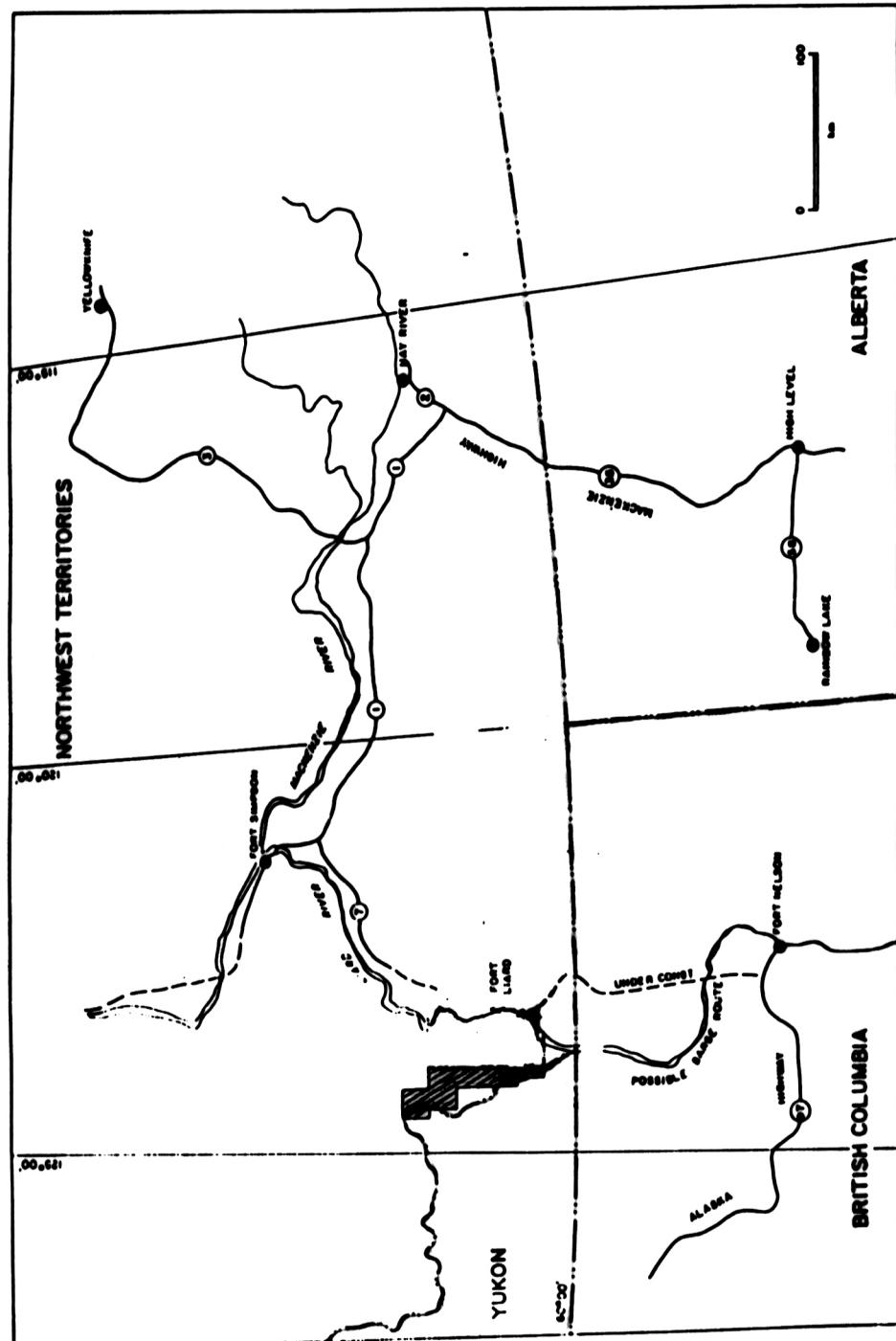
The Prospect area is a narrow N-S block which lies more or less along the Yukon-N.W.T. boundary. The block begins near the southern boundary of the N.W.T., envelopes the Kotaneelee Range of mountains (Kotaneelee) and culminates to the north over the Etanda Dome (Jackfish).

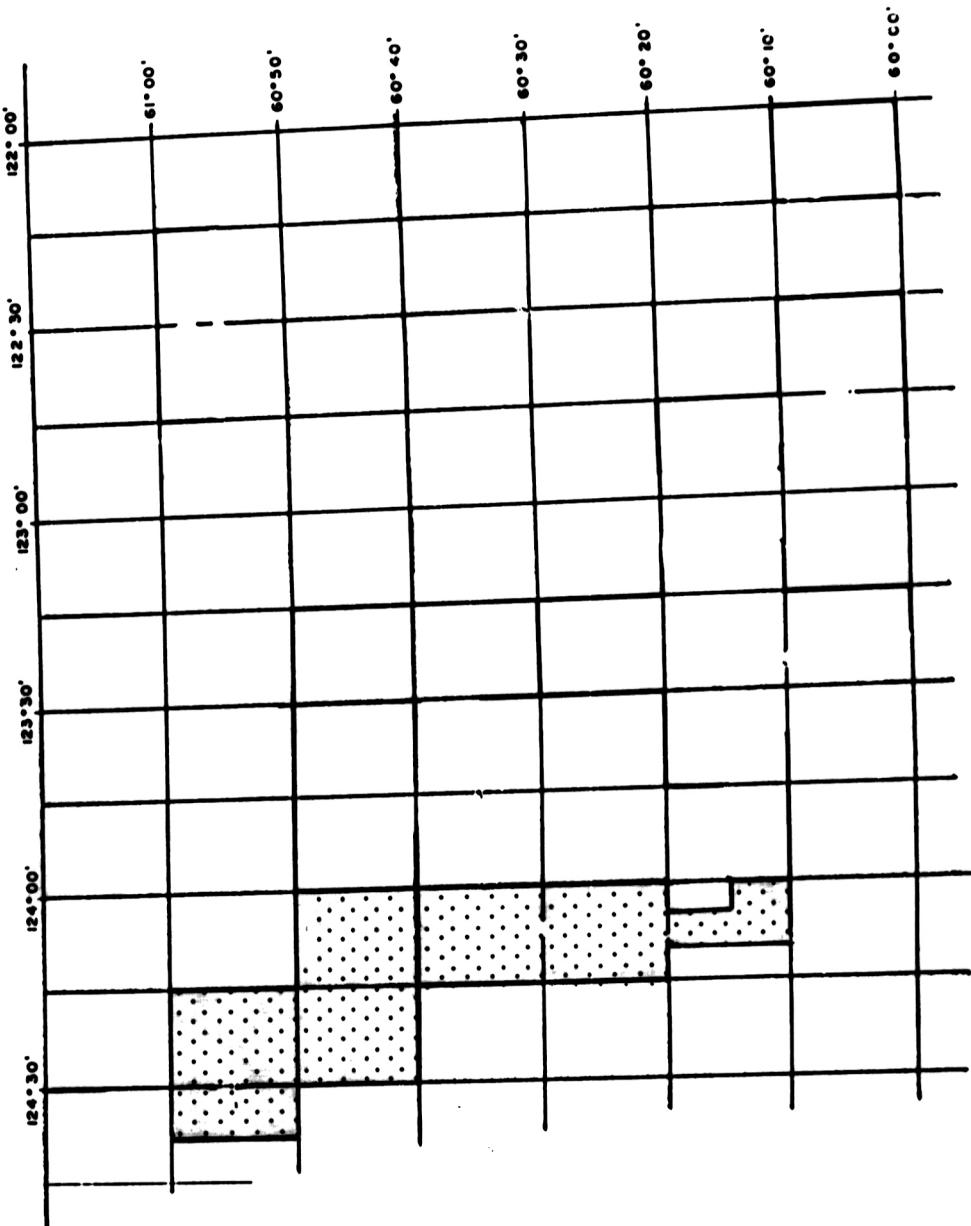
The Kotaneelee seismic program was undertaken to prospect for hydrocarbon accumulations analogous to the Beaver River gas field which lies to the south and/or the Pointed Mountain gas field which lies to the east. Both fields produce from the Middle Devonian Carbonates (Nahanni?). The Pan Am Kotaneelee 0-67 well which had been drilled in about the center of the block had encountered uplifted, porous but wet Nahanni carbonates.

The seismic program in Jackfish was undertaken to obtain seismic confirmation that the Etanda Dome feature which was based on surface geology had in fact a corresponding Middle Devonian Carbonate core.

In concert with "land use" and "environmental" personnel and in view of the remote location, limited access and formidable topography, the seismic program was divided into two operations. From late June to late October, 1983, a Sefel Geophysical helicopter portable seismic program was undertaken and 79.8 km of 12000' seismic was recorded (68.3 km at Kotaneelee, 11.5 km at Jackfish). From late December, 1983, to late February, 1984, a Sefel conventional seismic crew (Party 506) was used to record 48.4 km of 4800' seismic (35.4 km at Kotaneelee and 13 km at Jackfish).

The seismic data obtained ranged from very poor to good quality and on the whole proved adequate. The Jackfish program confirmed a Middle Devonian Carbonate core was present under the Etanda Dome and that the well location was adequate to test the structure. Unfortunately, the well did not encounter reservoir quality rocks in the carbonates. The Kotaneelee program failed to reveal any significant Nahanni play.





3A

IIIA. STATISTICAL SUMMARY
SUMMER PORTABLE CREW

Mobilization: occurred with the arrival of the scouting and advance personnel in late June, 1983.

Demobilization: was effected on or about October 28, 1983. As the program also included the Sawmill and South Sawmill areas, this date does not strictly apply to Kotaneelee/Jackfish. The Kotaneelee/Jackfish portion likely concluded on or about October 4, 1983.

Significant Dates:

- late June, 1983 - advance party arrival, equipment barged and trucked to site.
- July 3, 1983 - surveyors arrive and commence chaining.
- July 5, 1983 - slashing crew arrives and line clearing by hand commences.
- July 8, 1983 - portable drills and crews arrive and drilling commences.
- July 24, 1983 - recording equipment arrives.
- Aug. 1, 1983 - recording crew arrives and shooting commences.
- Aug. 18, 1983 - recording crew returns to Calgary (caught up to drills).
- Sept. 4, 1983 - recording crew returns to prospect.
- Oct. 4, 1983 - recording crew returns to Calgary, prospect completed.

Personnel

The total crew consisted of 56 to 57 personnel all of Canadian nationality. The make-up was as follows:

- 1 - Party Manager
- 1 - Clerk (Clerk, Powderman, Supply Driver)
- 1 - Mechanic (Water Hauler)
- 1 - Operator
- 1 - Junior Operator
- 1 - Shooter
- 1 - Shooter's Helper
- 1 - Head Linesman
- 10 - Recorder Helpers
- 5 - Survey Crew (When Needed)
- 6 - Slashers
- 1 - Drill Co-ordinator
- 9 - Drillers (When Needed)
- 9 - Drillers' Helpers (When Needed)
- 1 - Drill Mechanic
- 2 - Kitchen Staff
- 1 - Camp Attendant
- 2 or 3 - Pilots
- 2 - Chopper Mechanics

Production Data

79.8 kilometers of 1200% seismic reflection data were collected in 20 recording days yielding an average production rate of 4 km/day.

Conditions

The formidable terrain required that all movements be assisted by helicopter transport. This included the pickup of cable and geophones and the "doghouse". Fog, wind and

treacherous terrain, not to mention bears, all contributed to a slow and expensive operation. Most of all, the drilling conditions were frightful. The portable drills had to be dismantled and reassembled for each move or even for a skid. Each movement required the Bell 214 helicopter and with eight drills working unavoidable delays were experienced. The drills were fundamentally "hard rock" devices and over the Mattson outcrop in particular, the alternating hard and soft rock layering resulted in collapsed holes and/or "sticking" on hard ledges. Loading the "spec" charges at the "spec" depth was frequently impossible. Compromises on "specs" and finding a suitable drilling mud proved necessary to obtain reasonable production.

Down Time Factors

In all some 16 full days were directly lost due to adverse weather along with many minor daily delays due to helicopter availability and/or wind and fog. The drilling problems as mentioned previously were responsible for recording crew shutdowns for lack of holes of at least 14 days.

IIIB. STATISTICAL SUMMARY
WINTER PROGRAM

Tractors arrived at the program site December 29, 1983, drilling began January 15, 1984, and recording commenced January 29, 1984. The field survey was completed February 25, 1984 - a total of fifty-six days being worked of which twelve were recording days.

Between forty-three and fifty-eight Canadian personnel - the total field complement - were employed on the program.

Basic Crew

- 1 - Party Manager
- 1 - Clerk
- 1 - Mechanic
- 3 - Camp Staff (Cook, Helper and Camp Attendant)
- 4 - Survey Crew
- 1 - Observer
- 1 - Junior Observer
- 1 - Shooter
- 1 - Shooter's Helper
- 4 - Line Truck Drivers
- 8 - Recording Helpers
- 4-9 - Drillers
- 4-9 - Drill Helpers
- 2-4 - Water Truck Drivers
- 4-7 - Cat Skinners
- 1 - Tractor Operator
- 1 - Cat Foreman
- 1 - Cat Supervisor

48.4 kilometers of seismic coverage were obtained, the daily production averaging four kilometers. The area was very rugged with the coulees along the mountainsides causing particular problems. Tow cats were required on all lines and snow bridges often had to be built and maintained. Travel was slow and drilling was hard.

The weather remained reasonably cold, winds relatively light and snowfall average. Hence, no weather-related delays were experienced.

IV. DATA ACQUISITION EQUIPMENT AND FIELD PROCEDURES

Positioning Equipment

The horizontal and vertical positioning surveys were conducted using standard "land surveying" techniques. Theodolite and EDM measuring systems were employed with "take-offs" from governmental control points.

Aircraft

The summer portable crew utilized three helicopters which were contracted from Associated Helicopters Ltd. and Okanagan Helicopters Ltd., Calgary, Alberta. These were an A-Star, a Bell 215 and a Bell 206. Further air support for both winter and summer crews was provided by Villers Air of Fort Nelson, B.C.

All aircraft were of Canadian registry.

Energy Source

Dynamite was the energy source. For the summer portable crew, charge, depth and hole pattern were variable according to the surface geology. Based on Amoco Canada Petroleum Company Ltd. information and advice a standard single hole shot was used where the surface outcrop was not Mattson. This hole was loaded with 25 kg of dynamite at a depth of 23m. Where the surface outcrop was Mattson a two hole in-line pattern (10m separation) was shot with each hole to be loaded with 50 kg dynamite at a depth of 30m. Because of the severe drilling conditions these specifications were very difficult to meet and shallower holes with less charge were often the case. Shot holes were spaced every 100m.

The experience gained over the summer led to a drastic revision for the winter program. An examination of various field records representing a variety of charge sizes, hole depths, patterns and surface conditions revealed no obvious relationships between these parameters and record quality in this area. It was decided therefore to increase the stack to 4800g and use single holes loaded with 10 kg of dynamite at a depth of 17m. The shot holes were spaced every 40m. This approach significantly reduced the drilling time and the increased stack more than compensated for any loss in energy. In addition, costs were lowered.

Detector Equipment

Both summer and winter programs employed an 18 geophone in-line array at 3m intervals. The summer portable crew used Mark 10 Hz geophones and a group interval of 25m while the winter crew used Geospace 10 Hz geophones and a group interval of 40m.

Recording System

The summer crew employed a 96 trace Sercel 338 recorder while the winter crew used a 96 trace MDS 10 recorder. Both recorded at 2 milliseconds sample interval for six seconds of data in SEGB format. The summer crew used an 8/12-125/24 Hz field filter compared to a 12/18-125/72 Hz filter on the winter crew.

Processing Parameters

See accompanying section labels. No migration was performed.

V. DESCRIPTION OF DATA PROCESSING

KOTANEELEE

FIELD RECORDING	
DATE SHOT	FEBRUARY, 1984
SHOT BY	SEFEL GEOPHYSICAL LTD
SOURCE TYPE	DYNAMITE
SOURCE PATTERN	SINGLE HOLE
CHARGE SIZE	10 KG AT 17 M.
GEOPHONE TYPE	GEOSPACE 10 HZ
GEOPHONE PATTERN	9 OVER 40 M.
INSTRUMENTS	MDS-10
FORMAT	SEGB
DATA CHANNELS	96
RECORDING FILTER	12/18-125/72 HZ
RECORD LENGTH	6 SEC.
SAMPLE INTERVAL	2 MS.
GROUP INTERVAL	40 M.
SHOT POINT INTERVAL	40 M.
SPREAD GEOMETRY	1920-40-X-40-1920
DIGITAL PROCESSING	
1 DEMULTIPLEX WITH GAIN REMOVAL	2 MS
PROCESSING SAMPLE RATE	4800 PERCENT
2 CDP TRACE GATHERS	
3 INSTRUMENT PHASE COMPENSATION	
4 GEOPHONE PHASE COMPENSATION	
5 AUTOMATIC GAIN CURVE APPLICATION	
6 SPIKING DECONVOLUTION	
OPERATOR DESIGN WINDOW	
MIN OFFSET	350-1350 MS.
MAX OFFSET	700-1700 MS.
OPERATOR LENGTH	80 MS.
PREWHITENING	1 PERCENT
7 WEATHERING STATICS	VARIABLE DATUM
DATUM ELEVATION	3700 M/SEC.
DATUM VELOCITY	610 M/SEC.
WEATHERING VELOCITY	
8 VELOCITY ANALYSIS	
9 NMO	
10 AUTOMATIC RESIDUAL STATICS	
MAX CORRELATION LAG	+-40 MS.
WINDOW	500-2500 MS.
11 COMMON OFFSET STACK	
12 RESIDUAL NMO	
13 MUTE	4800 PERCENT
14 STACK	
15 TIME VARIANT FILTER	
0-1000 MS	14/22-65/75 HZ
1000-4000 MS	11/19-40/56 HZ
16 EQUALIZATION	
WINDOW	500-2500 MS.
17 VARIABLE TO FIXED DATUM CORRECTION	
FIXED DATUM	1600 M/ASL
18 FILM DISPLAY	16 TR/IN
	5 IN/SEC
POLARITY (X) NORMAL () REVERSE	
PROCESSING PARAMETERS SELECTED BY EMPRESS EXPLORATION CONSULTANTS	

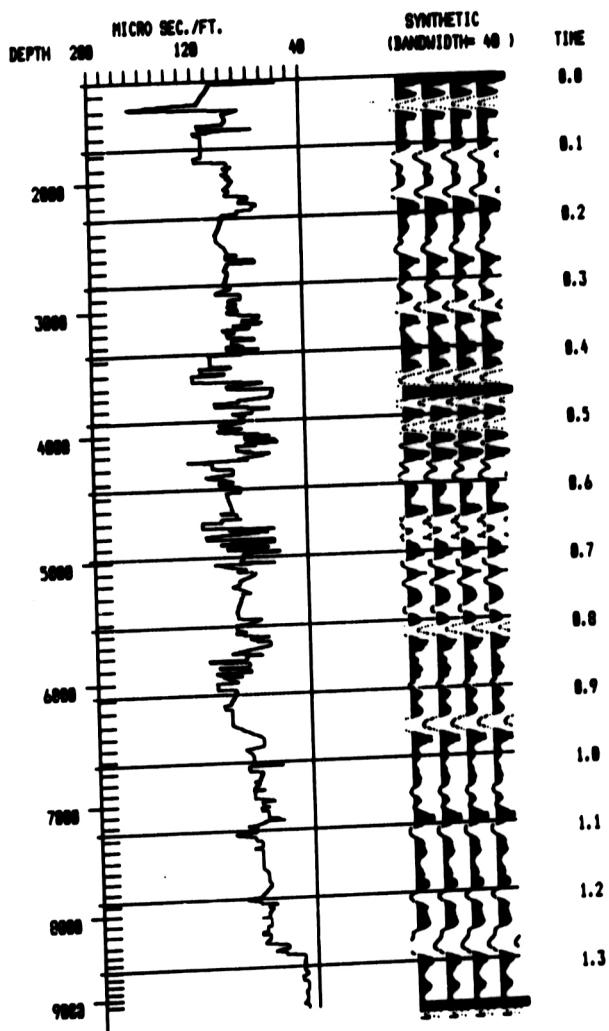
V. DESCRIPTION OF DATA PROCESSING

JACKFISH

FIELD RECORDING	
DATE SHOT	SEPT. 1983
SHOT BY	SETEL GEOPHYSICAL LTD
SOURCE TYPE	PARTY NO. 521
SOURCE PATTERN	DYNAMITE
CHARGE SIZE	SINGLE HOLE
GEOPHONE TYPE	1 KG. AT 20 M
GEOPHONE PATTERN	MARK-5 10 1/2
INSTRUMENTS	18 AT 3 M INT.
FORMAT	330 HR. SERCEL
DATA CHANNELS	SEGB
RECORDING FILTER	96
RECORD LENGTH	8/12-125/24 HZ
SAMPLE INTERVAL	6 SEC
GROUP INTERVAL	2 MS.
SHOT POINT INTERVAL	25 M.
SPREAD GEOMETRY	100 M.
	1200-25-X-25-1200
DIGITAL PROCESSING	
1 DEMULTIPLEX WITH GAIN REMOVAL	
PROCESSING SAMPLE RATE	2 MS
2 CDP TRACE GATHERS	1200 PERCENT
3 INSTRUMENT PHASE COMPENSATION	
4 GEOPHONE PHASE COMPENSATION	
5 AUTOMATIC GAIN CURVE APPLICATION	
6 SPIKING DECONVOLUTION	
OPERATOR DESIGN WINDOW	
MIN OFFSET	350-1350 MS.
MAX OFFSET	700-1700 MS.
OPERATOR LENGTH	80 MS.
PREWHITENING	1 PERCENT
7 WEATHERING STATICS	
DATUM ELEVATION	VARIABLE DATUM
DATUM VELOCITY	3700 M/SEC.
WEATHERING VELOCITY	610 M/SEC.
8 VELOCITY ANALYSIS	
9 NMO	
10 AUTOMATIC RESIDUAL STATICS	
MAX CORRELATION LAG	+40 MS.
WINDOW	500-2500 MS.
11 COMMON OFFSET STACK	
12 RESIDUAL NMO	
13 MUTE	1200 PERCENT
14 STACK	
15 TIME VARIANT FILTER	
0-1000 MS	14/22-65/75 HZ
1000-4000 MS	11/19-40/56 HZ
16 EQUALIZATION	
WINDOW	500-2500 MS.
17 VARIABLE TO FIXED DATUM CORRECTION	
FIXED DATUM	1600 M/ASL
18 FILM DISPLAY	16 TR/IN
	5 IN/SEC
POLARITY (X) NORMAL () REVERSE	
PROCESSING PARAMETERS SELECTED BY EMPRESS EXPLORATION CONSULTANTS	

EMPRESS EXPLORATION CONSULTANTS
200-4400 Macleod Trail S.
Calgary, Alberta

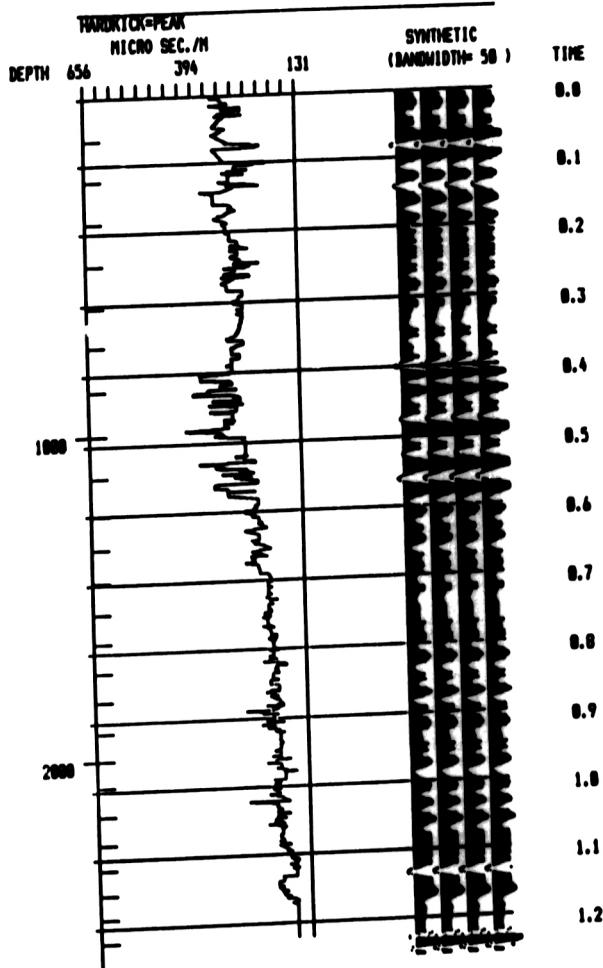
SONIC LOG AND SYNTHETIC
WELL NAME PAN AM KOTANELEE 0-67 B-1
LOCATION 60, 28, B/ 124, 12, 0
PROV/ST NAT
1st DEPTH 1300
LAST DEPTH 9200
KB 4003
SD 0



EXPRESS EAMLUWAHUN TUNGULAHVUD
288-4488 Macleod Trail S.
Calgary, Alberta

SONIC LOG AND SYNTHETIC

WELL NAME	NORTHERN et al JACKFISH L-63	
LOCATION	68, 52, 48/ 124, 27, 57	
PROV/ST	NWT	
1st DEPTH	200	
LST DEPTH	2700	
KB	1143.6	
SD	0	



VII. DISCUSSION

A. Kotaneelee

The area under study is structurally complex. The data quality ranged from no data to quite good and was generally adequate. The interpretation approach was as follows:

a) The well data from Kotaneelee 0-67 was tied onto the KOT 1 line.

b) Total corrections were noted and surface geological information was transferred onto each line.

c) Seismic correlations were made to tie the key geologic events (Base Cretaceous, Base Mattson, 1st Black Shale and Nahanni).

d) Working depth sections were constructed as an aid to and check on the seismic time correlations. Surface and well geology were tied, seismic events followed, layer thicknesses were kept stable and known and observed faults fitted. Constant interval velocities were employed in this exercise as the limited velocity information available proved to be both highly variable and unpredictable. These velocities were:

Cretaceous	3500 m/s
Mattson	4000 m/s
Besa River	3400 m/s
1st Black Shale	4200 m/s

e) Time and depth structure maps were prepared for the Nahanni, Base Cretaceous and Base Mattson events.

The area surveyed lay between the Kotanelee 0-67 and the Kotanelee P-50 wells. No significant prospects were found. Surface geology suggests that the 0-67 anticlinal feature extends to the north. Additional seismic is recommended to test for any structural closure in this region.

B. Jackfish

The Estanda Dome is a surface geology feature which was interpreted as having four-way closure. The question which arose was whether the Middle Devonian Carbonates were involved in the closure. The seismic which was recorded indicated a closure appeared to exist at depth and the Jackfish well was drilled. The well encountered non-porous carbonates.

A Time Structure Map of the Carbonate was prepared and is submitted.

Acknowledgments

A.T. Lamb
Empress Exploration Consultants