

**PROGRAM NUMBER: #N96B579**  
**OPERATING LICENSE: #855**

## **KOTANELEE, N.W.T.**

9229 - H G - 1 E

**SURVEY TYPE: SEISMIC GEOPHYSICAL SURVEY**

**SURVEY LOCALITY: KOTANEELEE, N.W.T.**  
**FT. SIMPSON, ADMIN. AREA**  
**124°15'00"E, 60°40'0"N**

**YEAR OF FIELD WORK: 1996**

**PROGRAM OPERATOR: HUSKY OIL OPERATIONS**  
**100% INTEREST**

**PRIME CONTRACTOR: GECO-PRAKLA**

**SPECIFIC INTEREST: FIELD DATA ACQUISITION**

**SEPTEMBER 15, 1997**

*Q. 002/97*

## TABLE OF CONTENTS

I.	Introduction	1
II.	Locality Map	2
III.	Significant Dates	3-4
IV.	Acquisition Parameters & Procedures	5-6
V.	Geophysical Data Processing Summary	7
VI.	Interpretated Summary	8
VII.	Figures (See Table of Figures)	

## TABLE OF FIGURES

<b>Figure 1</b>	<b>Seismic Shot Point Map</b>
<b>Figure 2 - 7</b>	<b>Migrated Seismic Section Displays</b>
<b>Figure 8 - 13</b>	<b>Interpreted Migrated Seismic Section Displays</b>
<b>Figure 14 - 19</b>	<b>Depth Model Display</b>
<b>Figure 20 - 21</b>	<b>Interpreted Summary</b>
<b>Reproducibles -</b>	<b>Figures 1, 14 - 21</b>

## I. INTRODUCTION

Husky Oil's Kotaneelee 1996 seismic program consisted of 89.7 km of helicopter supported seismic. The program consisted of six (6) lines of lengths varying from 13.7 km to 16.8 km.

The program was designed to gather information over Husky's exploration block at the southern end of the Kotaneelee Range, by utilizing the existing resources, equipment, manpower and infrastructure available in Fort Liard/Kotaneelee area of the Northwest Territories.

Field operations began June 27, 1996. The first field operations were made by local aboriginal crews in clearing/slashing the proposed lines. Approximately 68 km required slashing a one (1) metre wide path. The remaining 22 km were over barren land where no clearing was required. This was preplanned from detailed review of topographical maps and aerial photos.

Shot hole drilling commenced on July 11, 1996 with detailed GPS control, for the program, starting on July 12, 1996. The conventional survey followed on July 17, 1996.

Line clearing and surveying were completed on August 14, 1996 with shot hole drilling finalized on August 16, 1996. The recording of the data was started on July 24, 1996 and was finalized on August 28, 1996. An average of 3.7 km/day was recorded. Operations were completed on August 29, 1997.

The data was processed using pre-stack time migration algorithms with data quality being considered fair to good.

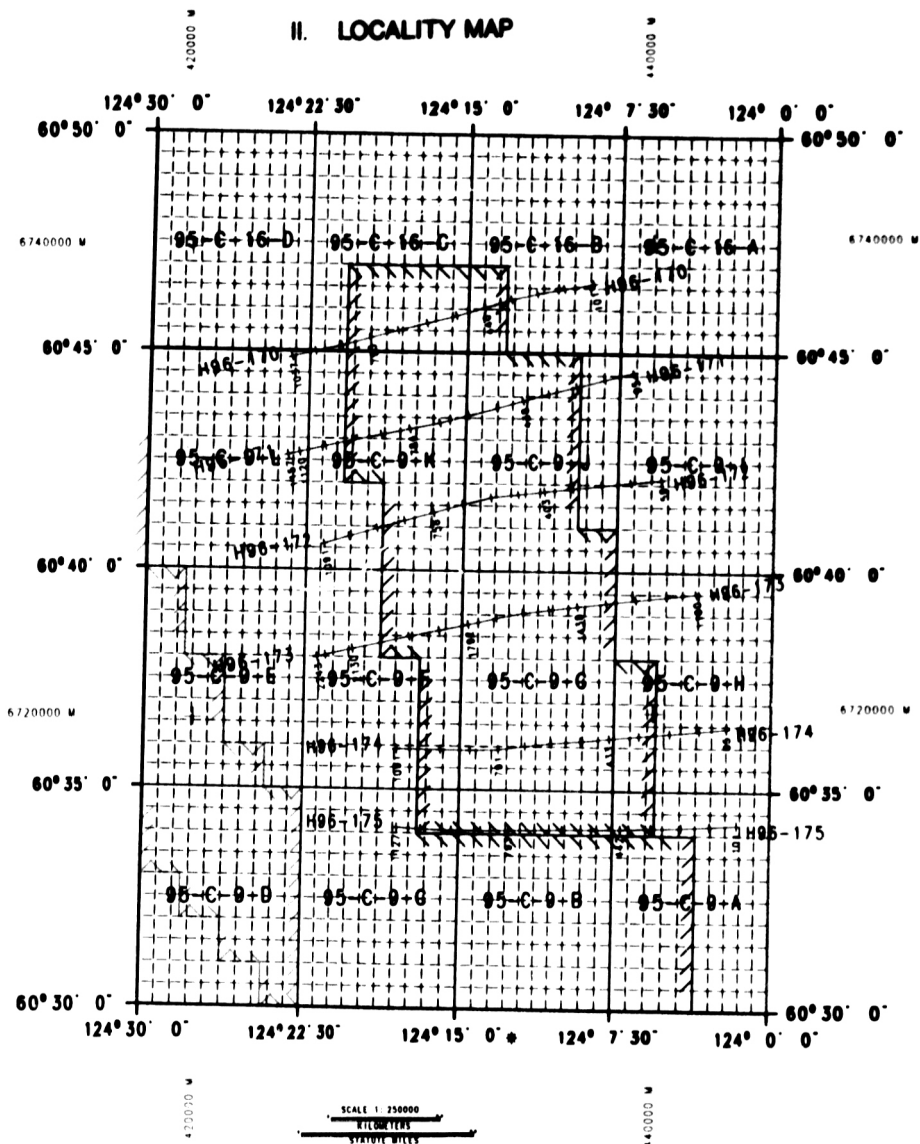
The interpretation of the data is summarized in the attached map. Both time and depth interpretations of the Nahanni formation are supplied. (Fig. 20 & 21)

The depth maps were generated from time interpretation sections (Fig. 8 - 13). Depths were then calculated using a modeling program. From this a depth section is generated (Fig. 14 - 19) and a final depth interpretation map generated and displayed in Fig. 20.

The geological and geophysical summary is given in a later portion of this report.

Details of the safety and operational considerations of the seismic programs acquisition are tabulated in an attached report.

## II. LOCALITY MAP




Postings & Leases as of  
AUG 14, 1994

APR. 1998 POSTINGS  
HELD LANDS

### WELL LEGEND

▽ MISCELLANEOUS/OBSERVATION		
■ SERVICE	♦ ABANDONED	RE-ENTERED
	ABANDONED	SUSPENDED
○ LOCATION	♦	♦
● OIL	♦	♦
● GAS	♦	♦
● OIL & GAS	♦	♦
● DISPOSAL	♦	♦
● FARM GAS	♦	♦
INJECTORS:	ABANDONED	SUSPENDED
● OIL		♦
● GAS		♦
● WATER		♦
● STEAM		♦

 <b>HUSKY OIL OPERATIONS LTD.</b> EXPLORATION & PRODUCTION DEPARTMENT CALGARY - ALBERTA - CANADA Ketonelee, B.C. Seismic Program		
Sellers by DYNAMIC SOLUTIONS LTD		AUTHOR: C. LAWS/DFR
DATUM: NAD 27	DATE: 07-05-90	CONTOUR: 10'
UTM SCALE: 0.0000		CENTRAL MERIDIAN: 122.00

### III. OVERVIEW OF SEISMIC OPERATIONS - SIGNIFICANT DATES

June 13, 1996

Husky Field Representatives, Dave Lochhead and Murray Place traveled to Fort Liard to meet with Chief Harry Deneron.

June 27, 1996

Began slashing operation on line H97-173

July 11, 1996

Drilling commenced on line H97-173

July 12, 1996

Commencement of GPS control survey

July 17, 1996

Conventional survey started up.

July 24, 1996

Recording started on line H97-173.

August 14, 1996

Slashing and chaining of program complete

August 16, 1996

Completion of drilling on program

August 28, 1996

Recording and reclamation complete. An average of 3.7 km/day for recording production for this program.

August 29, 1996

Final inspection completed by Scott Davidson and Husky Representative, Bert Cowan.

### **III. SIGNIFICANT DATES - cont'd**

#### **COMMENCEMENT AND COMPLETION DATES**

Murray Place - Field Representative, Husky - June 27 - Aug. 13

Bert Cowan - Field Representative, Husky - July 24 - Aug. 29

Chaining - July 11 - Aug. 12

Surveying - July 11 - Aug. 16

Slashing - June 27 - Aug. 12

Drilling - July 11 - Aug. 17

Recording - July 24 - Aug. 28

#### **PRE-JOB CONSULTATIONS**

May 2, 3 and June 16 - Dave Lochhead, Murray Place, Vern Chocan

Later dates - Jim Wickens, Jeff Tooth

#### IV. ACQUISITION PARAMETERS & PROCEDURES

##### HUSKY OIL OPERATIONS LTD.

**Prospect: Chinkeh Creek**

**Date: September 26, 1997**

##### SOURCE PARAMETERS

- |  |          |
|--|----------|
| • Source type                              | Dynamite |
| • Source array interval                    | 90 m     |
| • Source pattern description               |          |
| - Holes per shot point                     | 1        |
| - Distance between holes within shot point | n/a      |
| • Charge size                              | 14 kg    |
| • Charge depth                             | 18 m     |

##### RECEIVER AND CABLE DESCRIPTION

- |  |           |
|--|-----------|
| • Spread   | Symmetric |
| • Number of channels   | 400       |
| • Group interval   | 15 m      |
| • Fold   | 3300%     |
| • Near offset distance (centre of source array to centre of near receiver array) | 7.5 m     |
| • Far offset distance (centre of source array to centre of far receiver array)   | 2992.5 m  |
| • Number of groups in gap  | 0         |
| • Geophones per group  | 6         |
| • Geophone spacing   | 2.5 m     |
| • Geophone natural frequency   | 14 hz     |
| • Geophone damping   | 70%       |
| • Geophone base  | marsh     |

##### RECORDING PARAMETERS

- |                             |                   |
|-----------------------------|-------------------|
| • Instrument type and model | IO System II      |
| • Sample rate               | 2 ms              |
| • Record length             | 5 s               |
| • High cut filter and slope | to be determined  |
| • Low cut filter and slope  | 125 hz, 120dB/oct |
| • SSF                       | Out               |
| • HPE                       | Out               |

##### SURVEY REQUIREMENTS

- These are according to Husky standards which are provided by David Lochhead



#### **IV. ACQUISITION PARAMETERS & PROCEDURES - cont'd**

##### **EQUIPMENT**

##### **SURVEY EQUIPMENT**

- Trimble 4000 SSI GPS receivers
- Wild T1010 Electronic Theodolites
- Accuracy was N5 x E3 x V 4 cm

##### **DRILLING EQUIPMENT**

- Explorer 1500
- Heli: Bell 212, Sikorsky 58T

##### **RECORDING EQUIPMENT**

- I/O System II
- 800 Channels
- Geophones: marsh

##### **CHAINSAWS**

- As supplied by slashing companies

##### **HELICOPTERS**

- AStar-BA
- AStar-B
- AStar B-1
- Bell 205
- Bell 206B
- Bell 212

# V. GEOPHYSICAL DATA PROCESSING SUMMARY

## PROCESSING SEQUENCE

DEMULPLEX:	
PROCESS SAMPLE RATE	2.0 MS
PROCESS RECORD LENGTH	5.0 SEC
AMPLITUDE RECOVERY:	
EXPONENTIAL GAIN CURVE	K(T)PAREN(XEXP(PT)) K=1 A=0 N=2
TRACE EDITING:	
PHASE COMPENSATION:	
TYPE	GEOPHONE AND INSTRUMENT
DECONVOLUTION:	
TYPE	SURFACE CONSISTENT SPI:ING
OPERATOR LENGTH	120 MS
PREWHITENING	1 PCT
DESIGN GATE	1000- 3000 MS AT 7.5% OFFSET
	1300- 3000 MS AT 2992% OFFSET
SPECTRAL BALANCING:	
FREQUENCY	10 - 100 HZ
EQUALIZATION:	
DESIGN GATE	SAME WINDOW AS DECON
STATICS (REFRACTION):	
METHOD	GENERALIZED LINEAR INVERSION
FREQUENCY SPACING	EVERY SHOT
DATUM ELEVATION	1000 M
WEATHERING VELOCITY	762 M/SEC
REPLACEMENT VELOCITY	4000 M/SEC
SORT:	
TO EQUAL CDP INTERVAL	
VELOCITY ANALYSIS:	
TYPE:	CONSTANT PERCENTAGE MOVEOUT
STATICS (RESIDUAL): 1ST PASS	
TYPE	AUTOMATIC SURFACE CONSISTENT
CORRELATION WINDOW	400 - 2700 MS
MAXIMUM SHIFT	+/- 32 MS
CORRELATIONS PER TRACE	15
NUMBER OF ITERATIONS	2
VELOCITY ANALYSIS:	
TYPE:	CONSTANT PERCENTAGE MOVEOUT
STATICS (RESIDUAL): 2ND PASS	
TYPE	AUTOMATIC SURFACE CONSISTENT
CORRELATION WINDOW	400 - 2700 MS
MAXIMUM SHIFT	+/- 16 MS
CORRELATIONS PER TRACE	15
NUMBER OF ITERATIONS	2
PRE-STK MIG. VEL. ANALYSIS:	
TYPE	CONSTANT PERCENTAGE MOVEOUT
MUTE PATTERN:	
DISTANCE	300 360 3000 M
TIME	-300 300 1000 MS
EQUALIZATION:	
DESIGN WINDOW	400 MS AGC
FULL PRE-STACK MIGRATION:	
TYPE	KIRCHOFF SUMMATION
DATUM REFERENCED, TO PLOTTED WEATHERING REPLACED SURFACE,	
SEPARATELY AT SHOT AND RECEIVER	
STACK:	
SIGNE SUPPRESSION	3:1 THRESHOLD
FOLD	3300 PCT.
OUTPUT STACKED DATA:	
FORMAT	SEG-Y TO CLIENT REEL
FILTER:	
FREQUENCY	10/15-60/70 HZ
EQUALIZATION:	
DESIGN WINDOW	600 MS AGC
OUTPUT STACKED DATA:	
FORMAT	SEG-Y TO CLIENT REEL

## VI. INTERPRETATION SUMMARY

### KOTANEELEE SEISMIC INTERPRETATION:

Geological field mapping conducted in the summer of 1997 along seismic trails provided accurate seismic marker identification for shallow reflectors, including the Fantasque, Mattson and Besa River Formations. Correlation of deep markers on the Husky 2D data set required a jump correlation from the Kotaneelee O-67 well on Norcen's block to the south to the southern Husky line. Confirmation of this correlation was also possible using BFR's extension of line H93-173 to the east and west crossing the LaBiche and Flett N-19 wells. These correlations were difficult to use as significant stratigraphic changes occur across the synclines both to the east and west of the Kotaneelee block. It was also necessary to make a jump correlation across major thrust faults in both of these cases.

The final interpretation of the Nahanni Formation shows a large east verging detachment fold with a major antithetic fault. The feature forms a large northward plunging anticline, with the crest off the Husky block to the south. The Kotaneelee anticline is developed on a lower, basal detachment interpreted to be within the evaporites of the Lower Devonian Camsell Formation. There is also a more minor detachment in the shales of the Besa River Formation. The Besa River detachment results in a minor divergence of the exposed surface structure and the mapped subsurface structure at the Nahanni Formation level. A depth conversion of the Nahanni time structure map was generated using time interpretations of each seismic line input into the Outrider software package with interval velocities calculated from the O-67 well. The resulting depth structure map breaks out a small independent feature on the north end of the Kotaneelee anticline, with 200 meters independent closure

*Circle*  
*OK'd*  
*Oct 2/97*