Seismic Acquisition and Interpretation Report

Kotaneelee 3-D Survey

EL379

Kotaneelee Anticline

Northwest Territories

Conducted by Geco-Prakla

June-September 1996

for

NORCEN ENERGY RESOURCES LTD.

Operation Identifier
9229-N5-1E

January 1997

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INTRODUCTION

This report details the acquisition, processing and interpretation of approximately 111.9 square kilometers of 3D seismic data on Exploration License 379, Kotaneelee Anticline Northwest Territories (enclosure 1). This exploration license was granted to Norcen Energy Resources Limited, effective April 10, 1996. The data was acquired to allow a detailed interpretation of the prospectivity of the northern part of the licensed area. The acquisition contract was awarded to Geco-Prakla and the processing contract was awarded to Veritas Seismic of Calgary, Alberta. The project was initiated in July of 1996 and completed in September of 1996. The extreme nature of the topography required the survey to be fully heliportable (Enclosure 2).

Both pre- and post-stack migration processes were applied to the data. However, after reviewing the trials it was determined that the best results were obtained with pre-stack migration and this version was filmed.

The most significant mapable seismic horizon with economic significance is the near top Nahanni marker. This was picked and mapped as a time structure surface.

The results of our interpretation show clearly that the only well drilled on the block, the Kotaneelee O-67 well, was located close to the crest of a major anticlinal feature which has steep plunge to the north. The Kotaneelee O-67 well tested the primary reservoir objective, Nahanni dolomites, and was proven to be wet at the location. Based on an integration of the 3-D survey with existing 2-D data these surveys indicate that a small area of the crest of the anticline exists above the wet Nahanni reservoir proven in the O-67 well. However, the untested area is small and is located in the Yukon Territory, outside of permit EL379.

2. Seismic acquisition

a. **Introduction**

The advance work for the survey began in early June and recording ended in September of 1996. The survey was conducted by Geco-Prakla Party 1267. The 3D program consisted of approximately 111.9 square kilometers. The topography within the survey area consisted of extremely steep terrain with large areas of alpine with exposed rock. Weather conditions, such as high winds and rain shut down the advance crew for 18.5 days and the recording crew for approximately 116.5 hours.

The main staging area for the program was at the Amoco airstrip, located east of the camp at Pointed Mountain. Food, fuel and supplies came generally from Fort Liard and Fort Nelson and were transported to camp by barge, river boat and by air.

A startup meeting was held with the Chief, Harry Deneron, Norcen Client Representative, Charlie Trefanenko, and Geco-Prakla Project Supervisor, Milt Tetzlaff in May. Another startup meeting was held in June between the Beaver Enterprises Supervisor, J.D. Sorell, Land Use Representative, Scott Davidson and Kent Halvorson, and the Geco-Prakla Project Manager, Bob Dreaver. Meetings were held about once a week between the Beaver Enterprises Supervisor and the Geco-Prakla Project Manager. The Geco-Prakla Manager was in conversation with Land Use every week discussing progress on the project.

b. **Statistical Data**

Job History.

June 22 Began cutting on Norcen2D
June 26 3 crews brought in early due to rain and hail
June 29/30 Program changed from Norcen 2D to Norcen 3D. Flew one crew to line. Extremely windy. 2 crews on standby.
July 7 Began to survey/chain.
July 14 Moved up to 8 slashing crews. Moved up to 3 survey and 2 chaining crews. Survey and chain crews moved from Pointed Mountain to Fort Liard to make more room for cutting crews.
July 15 Rained out at 4.00 pm.
July 16 Crews pulled early due to heavy fog and rain.
July 17 Visit from NEB and Renewable resources. Received good reports from both.
July 18 Operations going well as long as weather does not force early shutdown. Helicopter costs down, production up. No accidents/near misses so far. Food arrived by boat and plane.
July 19 Crews rained out before noon.
July 21 Set up fuel staging in area which will save between 0.7 and 1 hour per day in helicopter time.
July 29 2 dropzoning crews working. Cutting going good. Extremely hot.
July 31 Starting drilling.
August 1 Drills on standby due to wind and rain. Cutting and survey also on standby.
August 4 Weather day. All crews on standby.
August 5 Weather day for survey and cutting crews. Drills got out at about 2.00 pm.

August 6 Pulled crews early due to rain and fog. 1 crew on standby all day due to low ceiling.
August 7 Weather day. All crews on standby.
August 12 Drills winded out
August 13 Drills winded out.
August 16 Rained in AM. Could not start until 1:00 pm. One drill crew and survey crew on standby.
August 17 Recording crew mobes from Tumbler Ridge to Fort Liard.
August 18 Several line changes/crew moves today. Barged recording crew equipment to 9 mile landing, offload, and set base staging at Pointed Mountain airstrip. Crew comes over in river boats. Began flying bags on line. Crew returned early due to heavy rain and fog.
August 19 Flew surveyors out to program - unable to get in. Destiny slashers demob. Recording crew on standby. Crew moves in to Pointed Mountain base camp.
August 20 Weather day - rain. All crews on standby.
August 21 Completed cutting just some dropzoning left. Too windy for drills to get out today. Rec. crew could not fly out until 10:30 am due to low fog.
August 22 5 drills working 3 on standby. Moved recorder onto line.
August 23 Drills on standby- high winds, rain. Recording crew on standby.
August 24 3 drills on standby for 6 hours, 2 drills on standby for 4 hours - high winds, rain.
August 25 Drills on standby due to high wind. Wind noise made it impossible to shoot.
August 26 Survey completed, just skids left to do. Drills on standby. Recording crew tried to get out at 7:00 am, but unable to land on prospect. Back to camp. Tried to get out again at 10:00 am. Got line ready to shoot, but wind was too strong.
August 27 Recording commences, 20 shots taken. All possible gear on ground. Client rep's Charlie Trefanenko and Grant Gairdner present.
August 29 Land use report was excellent. No concerns. Drills completed program and slung off line midday. Recording crew unable to fly until 12:30pm due to fog.
August 30 Surveyors surveying skids on standby. Recording crew found animal damage overnight. Unable to get spread up before being shut down by weather.
September 1 Recording crew found animal damage overnight again. Light, steady rain all day - unable to shoot - noise.
September 2 Wind was too strong to shoot. Entire prospect bag marked.
September 3 Completed surveying skids. Pickup and layout crews on standby until 11:00 am.
September 4 Weather moved in at 3:00 pm.

September 5 Low clouds in am. Unable to get crews out. Went out again at 2:00 pm with shooters, too windy to shoot. Stood by on mountain until 5:00 pm but wind did not let up. Snow storm moving in.
September 7 Weather day - fogged in all day.
September 8 Cleared snow off bagmarks for line 909.
September 9 Winded out most of day.
September 10 Bad cable first thing in the am. Shooting between wind gusts. Recorder moved at the end of the day.
September 12 Bad weather rolled in early (10:30 am). Pulled crews.
September 13 Storm rolled in and had to pull crews at 5:30 pm.
September 14 Weather day.
September 15 Crew down again all day due to weather - rain and fog.
September 16 Weather day - rain and fog.
September 17 Weather day - rain and fog.
September 18 Standby in am due to low fog. Ready to shoot by 3:00 pm, too windy.
September 19 Very windy. Started to pull crews off line at 12:00 noon. Shooters and observers standby on prospect; too windy to shoot. Pulled off line at 6:00 pm.
September 20 Complete shooting.
September 21 Weather day - rain.
September 22 Low fog stopped flying bags until about 1:30 pm. High wind caused the helicopter to fly less bags than usual. Approximately 230 bags left on mountain.
September 23 Unable to fly bags until 3:30 pm due to high winds.
September 24 High winds making it slow to fly bags. Picking complete.
September 25 All equipment flown off line.

Production Statistics.

Profiles Shot	653
Days Worked	39
Kms Recorded	111.9 square kilometers
Total shifts lost (weather)	116.5 hours
Total meters drilled	11213
Total No. Shifts (drills)	30
Total shifts lost (weather)	14

c. **Camp**

Beaver Enterprises

One 68 man camp side by side enclosed with 2 separate five room sleepers and 3 separate sleepers with 13 rooms. The camp also consisted of

offices, kitchen, dining and recreation facilities, first aid station, washroom facilities and generators. The camp was the location for 4 fuel sloops owned by Northern Mountain Helicopters and one incinerator.

The camp was located at Pointed Mountain. Cutting crews, survey crews and the recording crew stayed there throughout the program.

The support vehicle for camp was used for transportation and water hauling.

d. **Line Clearance**

The line clearance was performed by Destiny Resources and Beaver Enterprises Ltd.

Destiny Resources.

Supervisor	M.Leamy	
Handcutters	Ken Challand	Blain Weaver
	Kurt Qually	Wes Gordon
	Anton Milos	Arron Connolly
	Matthew Chalifox	Ralph Calder
	Rob Braun	Aubrey Burt
	Cody Challand	Kail Bonnar
	Shane Rear	Dave Kiyawasew
	Roger Dube	Gary Grainger
	Wilf Cardinal	Sandy Purdaby
	Percy Cardinal	Jason Walker
	Chris Nolan	Dan Lambert

Beaver Enterprises

Supervisor	Grant Gardiner	
Handcutters	Robert Nunde	Raymond Kotchea
	Antoine Bertrand	Raymond Bertrand
	Julian Klondike	Reg Bertrand
	Greg Lomen	Arnie Duntra
	Donny Bertrand	Mike Vital
	Willy Bertrand	Mark Vital
	Barry Bertrand	Floyd Diamond C
	Willie McLeod	Phillip Klondike
	Norman Sassie	Dale Diamond C
	Tony Berreault	Dufford Kotchea
	Dennis Nelson	Harry Capot Blanc
	Don Lomen	Ron Bertrand

Rob Badine	Herb Berreault
Jochim Klondike	Floyd Wilmsmeier
Dale Timbre	Jimmy Kotchea
Fred Bertrand	Steve Steeves
Alec Bertrand	Mervin Timbre
David Dantra	Brian Kotchea
Darrell Antoine	

Both companies were solely handcutting only with power saws and helicopter support. The cutting crews had a total of 61 shifts with 9 shifts lost due to weather.

e. **Survey**

Survey was performed by:

All Terrain Surveys Ltd.

Ken Keyes
Bev Keyes
Dan Tereault
Tim Tereault

Geomat-X Surveys Ltd.

Dave Cook
Greg Cassidy
Len Hooton
R. Blanchard
Stuart Irvine
Tim Makahoniuk
Mike Staldeker
Kelly Schmidt

The survey was done using conventional methods, using theodolites and EDM. In addition 8 GPS (Global Positioning System) points were obtained for survey control. All vertical and horizontal survey ties were within the acceptable industry seismic survey standards. No vehicles were used. The survey crew had 55 shifts with 10.5 shifts lost due to weather.

f. **Drilling**

Drilling Equipment

8 Heliportable Drills
1 Shop Trailer
1 12 Passenger Van
1 Mechanics Unit

Destiny Drilling

Foreman	Mike Leamy
Drillers	John Bjorkland
	John Hofer
	Neil Tucker
	Ira Iverson
	Brian Bak
	Dale Dei
	Mark Hoffer

All holes were drilled with heliportable air-hammer drills. The drill crew had a total of 30 shifts with 14 shifts lost due to weather

g. **Recording**

Geco-Prakla

Supervisor	Milt Tetzlaff/Scott Toten
Party Manager	Bobby Dreaver/Gerry Devaux/Doug MacDonald
Drill Push	Ron Dorwood
Head Surveyor	Bruce Riley
Surveyor	Ken Keyes/Dave Cook
Field Administrator	Kimi Lawrence/Tammy Thorson/Dawn Tofsrud
Instrument Technician	Jim Brack
Observers	Dave Berger/Len Taylor
Shooter	Brad Kraus/Todd Kosowan
Cable Repair	Andre Simmoneau/Moe L'Hoir
Supplyman	Warner Stienke/Jeff Luxton

RECORDING EQUIPMENT

Input/Output System Two™

The I/O SYSTEM TWO™ is an advanced delta sigma technology telemetry acquisition system offering numerous advanced recording and signal processing features found on no other recording system. Amongst those features are the following:

Full 24-bit analog to digital recording

Spectral Shaping Filter(SSF)
Enhanced Hi-Line Pickup Eliminator (HPE) - step resolution of 0.01 Hz over frequency band of DC to 420 Hz
Total Self calibration/Testing
Increased Spatial Sampling

The I/O SYSTEM TWO™ offers maximum flexibility during field deployment, thereby resulting in increased production. The benefits of digital transmission and the systems inherent protection against Hi-Line induced interference make it an ideal choice for this environment.

Reduced field battery power requirements (45% of SSTEM ONE) solar batteries
Automatic detection of pilot overscaling for vibroseis
Low cut filter of 32 frequencies of 3-90 Hz @ 12dB/octave slope
Alias filters of 100 Hz @ 4ms, 200 Hz @ 2ms, 400 Hz @ 1ms, 750 Hz @ 0.5ms

SSF for 3 start and 3 end frequencies for each of 3 gains, which may allow instrument suppression of the noise trains.

INPUT/OUTPUT SYSTEM TWO digital telemetry system. Comprising:

340	MRX's with batteries
510	Spare battery modules
2	Battery management system
10	ALX's (advanced line taps)
1	LIM's (line input module)
1	SCM (system control module)
1	SIM (system interface module)
2	SCSI (3480 cartridge drives)
1	OCM (operator control module)
2	HHT's (hand held terminal)
1	Printer

VEHICLES-RECORDING CREW

1 Air conditioned heli-portable Recording Cabin mounted on a F700 4x4. Separate diesel driven 17 kVA generator supplying power for air conditioning and instrumentation.

1 Party Manager Unit-F250 4x4

1 Line unit-F350 4x4

2 Transport units-F700 4x4 (or equivalent)

1 Support unit-F250 4x4

1 Mechanic unit-F250 4x4

1 Personnel carrier

1 Battery charging unit

1 Cable/Geophone repair trailer

2 Honda A.T.V. Quads

1 HSE Officers unit

COMMUNICATION/OFFICE EQUIPMENT

8 VHF mobile radio transceivers fitted to vehicles

24 VHF handheld radio transceivers

1 Facsimile machine

1 Photocopier

1 Portable computer

2 IBM Compatible P.C's for automated OB logs, administration and cost control

1 Midland Tx/Rx Repeater

RECORDING PARAMETERS

Program size	111.9 sq km
Record length	6.0 secs
Sample rate	2 ms
No. of traces live	960
Receiver interval	50 m
Phones/Group	9 over 25 m
Source interval	200 m
No. Receiver points	2937
No. Source points	633

Patch	8x120
No. Receiver lines	17
Receiver line length	146 kms
No. Source lines	12
Source line length	124.1
Hole depth	18 m
Charge size	12 kg
Field filters	Out
Notch filter	Out

SAFETY PROGRAM

For the advance crews, general safety meetings were held every Monday. issues discussed included wearing lifejackets when on the docks and/or in the boats, the speed limit on the Amoco road to the airstrip, around camp and in Fort Liard and on the Fort Liard Highway, wildlife on the roads, general hazards on the program and basic survival. Each crew was involved in a start-up safety meeting before going to the field.

For the recording crew, another safety start-up meeting was held covering all aspects of the program. They also continued having meetings once a week to go over the general hazards etc. Emergency Response Plans were distributed and placed in each vehicle.

Several spot safety briefings were held throughout the week pertaining to general health and safety and hazards on the program to be aware of.

h. **Conclusion**

The job had a lot more delays than expected due to terrain, weather and location of the prospect.

3. Processing Sequence

Processing of the 3D volume was provided by Veritas Seismic of Calgary and was performed during the fall of 1996. A very large number of tests were performed on the data to determine optimal processing parameters. The final display put to film was the pre-stack time migrated stack. The processing routine included the following:

1. Demultiplex

Processed length- 6000 ms
Sample rate- 2 ms

2. **Amplitude recovery**

   Type- T-V (exponent=2)
   T 500 - VRMS 4300, T 3900 - VRMS 5500

3. **Geometry -3D**

4. **Noise attenuation on shot gathers**

   Delta T -1000 +1500
   Minimum 120 Offset 5329
   Frequencies 5-15 Hz

5. **Deconvolution - minimum-phase surface consistent**

   Operator length: 100 ms Prewhitening: 1.0%

Distance	Design Gate	Appl. Gate
50 m	300-1500	0-6000 ms
4900 m	1800-3600	0-6000 ms

6. **Structure statics - 2 layer drift computation**

   Datum elevation: 1600 m asl.
   Replacement velocity: 4000 m/s
   Weathering velocity: 610 m/s

7. **Statics total**

8. **Interactive trace edits**

9. **Trace gather 24 fold**

10. **Preliminary velocity analysis - normal moveout**

    Type: Constant velocity stacks - interactive

11. **Statics - automatic surface consistent**

    Window: 1000-3000 ms Filter: 8/12-20/30 Hz
    Max. static: +/- 40 ms No. traces in model: 21

12. Velocity analysis - normal moveout

Type: Constant velocity stacks - interactive

13. Statics - automatic surface consistent

Window: 1000-3000 ms Filter: 8/12-20/30 Hz
Max. static: +/- 24 ms No. traces in model: 21

14. Final velocity analysis - normal moveout

Type: Constant velocity stacks - interactive
Referenced from surface

15. First break mutes

Stretch mute 130%

16. Statics - CDP trim

Window: 1100-3000 ms Filter: 8/12-20/30 Hz
Max. static: +/- 40 ms No. traces in model: 3x7

17. Amplitude equalization

AGC 1000 ms

18. Prestack migration velocity analysis

Constant velocity migration stacks

19. Full prestack time migration

Datum=1600m Replvel=4000 m/s
Migrated from surface Resampled to 8 ms
Half aperture = 120 bins (east-west)
Dips = 60-70
Output is a stacked section

20. Filter - time variant bandpass

Filter:	5/10-30-40Hz	0-2000ms
	5/10-20-30Hz	2500-4000

21. Amplitude equalization

Multi-gated mean
Window: 0-700, 800-1500, 1800-2500, 3000-4000

Final film displays of gathers along each source and receiver line were produced. These were displayed at a vertical scale of 5.0 inches /second and horizontal trace display of 8 or 12 traces/centimeter.

4. Interpretation

a. Regional setting

Permit EL379 is located in the Liard Plateau area of the Northwest Territories adjacent to the Yukon Territory. The major physiographic feature of the block is a north-south oriented mountain range, the Kotaneelee Range (figure 1). This steep sided mountain range is dissected by west to east oriented streams on the eastern side and flanked on the western side by a tributary valley to the Kotaneelee River which flows northward. The 3-D survey was designed to cover the northern half of the permit from the north-south tributary of the Kotaneelee River and part of the eastern slope of the Kotaneelee Range. The Kotaneelee Range is seen as the surface expression of a major anticlinal feature in the subsurface, the Kotaneelee anticline (enclosure 3). This structural element has been breached along its fold axis by erosion. Deep erosion has exposed Devonian and Mississippian shale's of the Besa River formation in the core of the anticline. These are overlain by hard and indurated sandstone's of the Mattson formation. The surface structural anticline is highly asymmetric, with a very steep western limb, which is, in certain areas, seen to be overturned to the west. The western vertical limb of Mattson strata forms a prominent ridge, as does the less steeply dipping eastern limb where the Mattson comes to outcrop.

b. Geological setting

Within the area of the permit the deepest known stratigraphy is comprised of Lower and Middle Devonian limestones and dolomites of the Arnica and Nahanni Formations (figure 2). These sequences are regionally underlain by Early Paleozoic clastics and carbonates, and probably Late Precambrian metasediments. These sequences are capped by regionally extensive shales, silts and restricted sandstone units of the Devonian-Carboniferous Besa River Formation. The Besa River Formation is seen at outcrop in the core of exposed anticlines. The Besa River Formation is capped by interbedded shales,

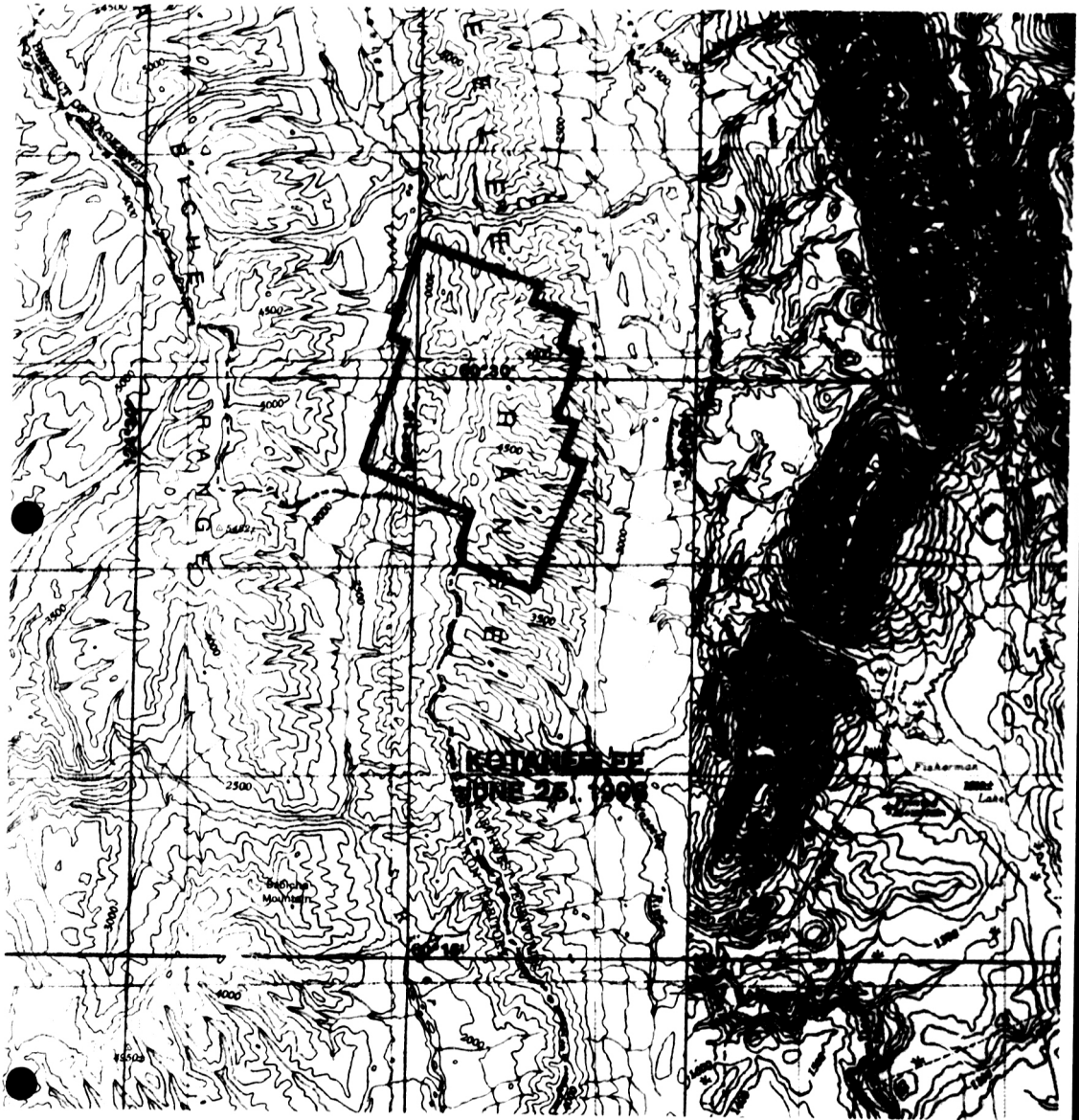

Figure 1

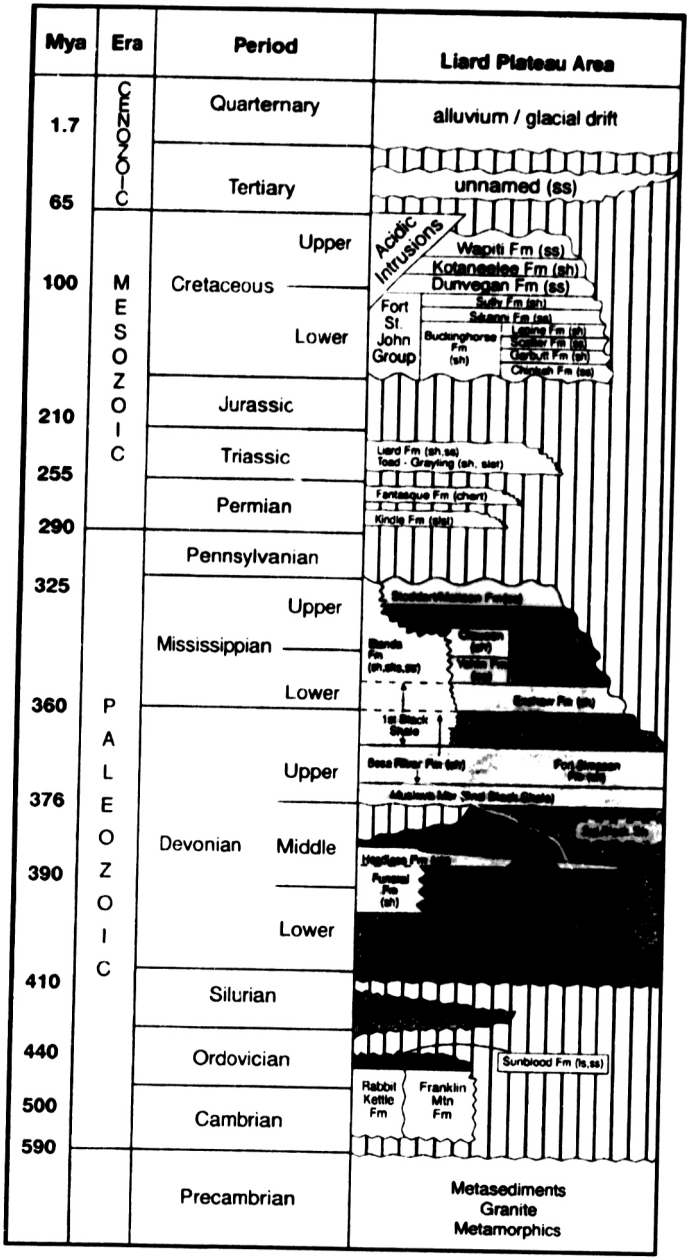
Mya
Era
Period
Liard Plateau Area
1.7
65
100
210
255
290
325
360
376
390
410
440
500
590
CENOZOIC
MESOZOIC
PALEOZOIC
Quarternary
Tertiary
Upper
Cretaceous
Lower
Jurassic
Triassic
Permian
Pennsylvanian
Upper
Mississippian
Lower
Upper
Devonian
Middle
Lower
Silurian
Ordovician
Cambrian
Precambrian
alluvium / glacial drift
unnamed (ss)
Acidic Intrusions
Wapiti Fm (ss)
Kotaneelee Fm (sh)
Dunvegan Fm (ss)
Fort St. John Group
Buckinghorse Fm (sh)
Liard Fm (sh,ss)
Toad - Grayling (sh, sltst)
Fantasque Fm (chert)
Kindle Fm (sltst)
Sunblood Fm (ls,ss)
Rabbit Kettle Fm
Franklin Mtn Fm
Metasediments
Granite
Metamorphics

Figure 2

sandstone's and limestones of the Carboniferous-Permian Mattson formation. The Mattson is in turn overlain by cherts of the Fantasque Formation which are Permian in age. In the valley areas locally restricted units of possibly Triassic and Lower Cretaceous sediments are to be found, which are also generally composed of shales and thin sandstone's.

The evolution of this portion of the North American craton began in the Late Precambrian with the onset of opening of the proto-Pacific. This rifting was accompanied by the establishment of horst and graben topography on the margin. These graben were filled with clastics and as thermal subsidence ensued the establishment of a long lived passive margin occurred. From the Cambrian to the Middle Devonian a series of carbonate shelves built out from east to west in to a deeper marine shale dominated basin. In the late Devonian to Mississippian this shale dominated basin was even more widespread as it transgressed eastward.

The most significant tectonic event was the uplift of the Cordillera which initiated in the Early Cretaceous. This tectonic event fold and thrust the thick Paleozoic sequences of the present foothills belt. Uplift of the mountain chain led to restriction of the seaway to the east and initiated foreland deposition throughout the region.

The only known reservoir potential in this area is provided by the Nahanni and Arnica Formations. These are regionally tight limestones. However, they are locally transformed by hydrothermal dolomitization in to the Manetoe Facies. The average porosity of the Manetoe dolomites is only 3.5% and they have permeability's of 7-200 mD. To achieve an effective productive capacity these units have to be enhanced by fracturing induced by folding during the Laramide orogeny.

The source rocks for regional gas reserves is provided by basinal shales of the Besa River Formation. These are immature to the east and over mature to the west in the Liard area. It is interpreted that these source rocks achieved maturity in the Late Paleozoic. Present day entrapped hydrocarbons are the result of thermal cracking of pre-existing oils during the Mesozoic. Secondary migration and accumulation occurring during and after the Laramide deformation phase.

All the known trapping potential in the area is provided in thrust and fault controlled anticlines formed during the Laramide orogeny (figure3). A wide variety of fold, thrust and high angle reverse fault traps have been identified in the foothills belt. It is very apparent that fracturing associated with fold propagation is a key element in providing effective reservoir. Location of wells along the crest and leading edge of folds is of paramount importance.

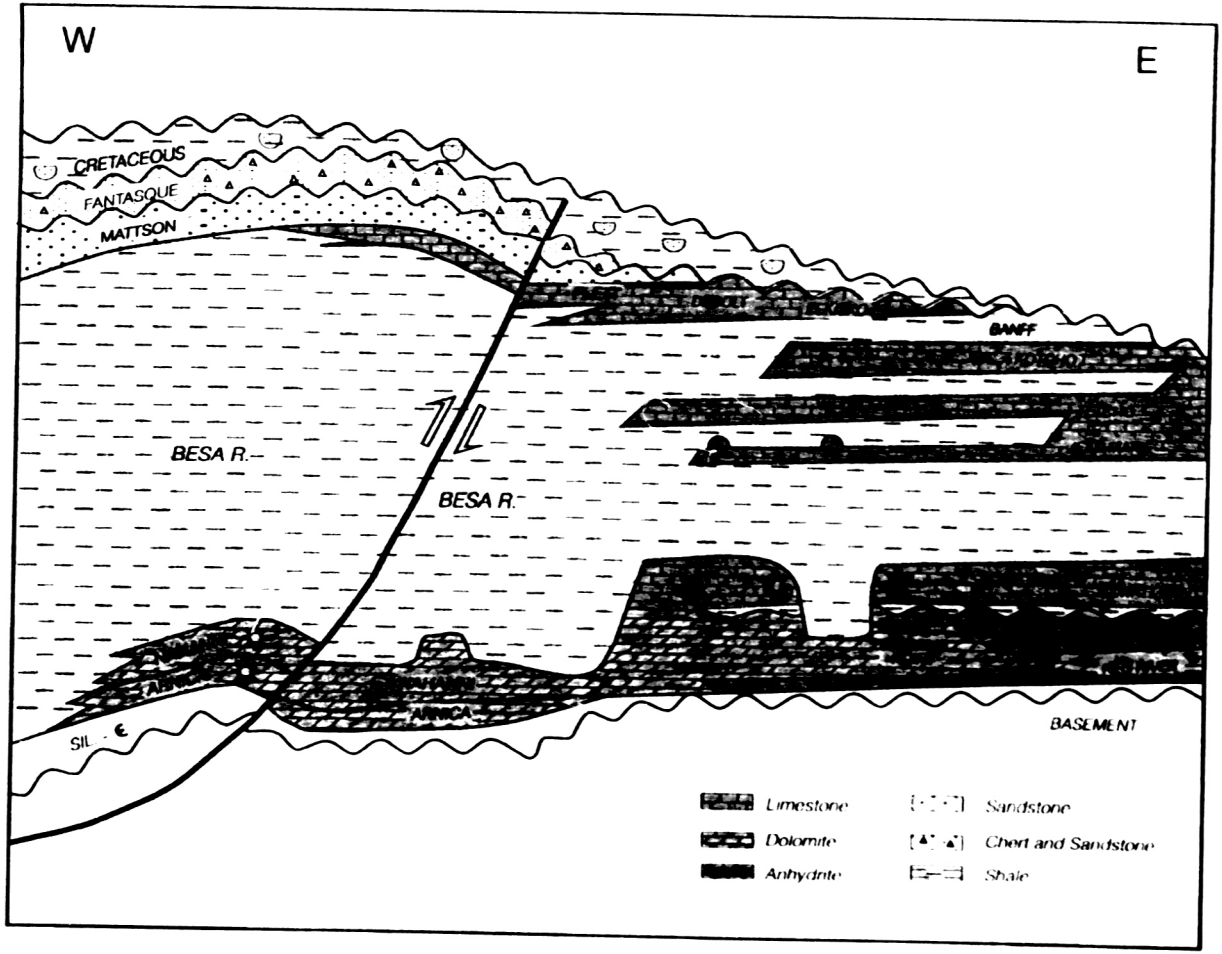
W
E
CRETACEOUS
FANTASQUE
MATTSON
BANFF
BESA R.
BESA R.
ARNICA
BASEMENT
Limestone
Dolomite
Anhydrite
Sandstone
Chert and Sandstone
Shale

Figure 3

c. Seismic Interpretation

Only one seismic event has significance for determining the prospectivity of the EL379 permit, that is the Near Top Nahanni marker (enclosure 4). This marker was identified on the seismic by use of a synthetic seismogram generated from the sonic log run in the Kotaneelee O-67 well (enclosure 5). Two seismic gathers are included which pass through the surface location of the O-67 well (enclosures 6 and 8). Trace 122 is a NW-SE gather through the well (enclosure 6). This gather has two markers picked, the blue marker is the Near Top Nahanni pick, at 1600 ms below the O-67 surface location. The second marker, yellow, is a regional marker recognized within the Besa River Formation. This marker is generally seen to be sub-parallel to the Near Top Nahanni marker. Trace 122 shows very clearly the steep SE dip of all formations from the Nahanni and shallower. At the Nahanni level the horizon drops from around 1500 ms to below 1900 ms TWT in a little over 5 kilometers.

Line 162 (enclosure 8) is a NE-SW gather through the O-67 location. The line illustrates the very steep northerly plunge of the Kotaneelee anticline. The Near Top Nahanni marker dips from around 1500 ms in the south to 2100 ms TWT in the north. On this line only minor southward directed normal faulting is observed. The intra-Besa River marker is once again seen to be sub-parallel to the Nahanni marker. It can also be observed on this line that the extra section within the Besa River Formation which pushes the Nahanni to great depth is a wedge of sediment onlapping to northerly dipping beds in the 1000-1300 ms interval.

Further northwards in the 3-D survey trace 72 (enclosure 7) illustrated the nature of the structural form of the Kotaneelee anticline. It is interpreted that the Nahanni and overlying Besa River section is folded along a westward vergent thrust or high angle reverse fault. Throw across the fault at this position is around 500 ms, it is observed that the throw varies considerably along the length of the fault. It can be as little as 100 ms to close to 1000 ms TWT.

To the west of the major Kotaneelee fault the structural picture is much different. Line 374, a NE-SW gather (enclosure 9), illustrates the gently folded nature of the Nahanni . On the Nahanni Structure map (enclosure 4) the gentle fold observed on line 374 is seen to be a NNW-SSE oriented shallow relief ridge flanked by shallow relief lows. Line 374 also illustrates the nature of the Besa river to the west of the structure. Here it is seen that the dip magnitude of Besa River reflectors increases up section. Once again illustrating the very massive increase in Besa River section to the north.

The structural contour map on the Nahanni marker (enclosure 4) demonstrates the curvy-linear nature of the main Kotaneelee fault. The Nahanni plunges steeply to the north and to the south of the O-67 location. The main

anticline is cut by a number of normal faults , not illustrated. None of the observed cross faulting is of sufficient magnitude to provide a flank trap. The only untested part of the structure lies to the SW of the O-67 bottom hole location.

a. Conclusions

Based on regional considerations, only one known interval provides reservoir potential in the area of the permit, this is the Manetoe dolomite facies of the Devonian Nahanni Formation. Deeper reservoir potential may exist in the Arnica and other earlier Paleozoic carbonates. However, the potential for vertical seals between formations must be considered very speculative. The Kotaneelee O-67 well penetrated a broad fault controlled anticline with steep plunge to the north of the well location, based on the Kotaneelee 3-D survey. This data combined with existing 2-D demonstrates that the O-67 well was located close to the crest of the feature and proved the reservoir to be water bearing. It is our interpretation that the well has adequately tested the only significant feature in the area of EL379.

The presence of a well defined structure with an apparent good top seal and reservoir development which has been proven to be wet raises some questions regarding regional hydrocarbon trapping. It is possible that the volume of generated and preserved hydrocarbons within the system is less than that required to fill present day trap potential. The Pointed Mountain structure to the east and the La Biche feature to the west both show under filled structures. The other potential reason for a lack of hydrocarbon fill in the Kotaneelee structure could be late timing of the feature relative to secondary hydrocarbon migration. Further regional exploration and drilling of other structures may shed light on this problem.