007-09-06-153

REPORT TO THE GOVERNMENT

Carcajou Marine, Northwest Territories

007-09-06-153

REPORT ON A SEISMIC SURVEY

OF THE

CARCAJOU RIVER AREA, N.W.T.

CONDUCTED FOR

TRANS-PRAIRIE PIPELINES LTD.

IN JULY , 1973

BY

IMPERIAL OIL LTD.

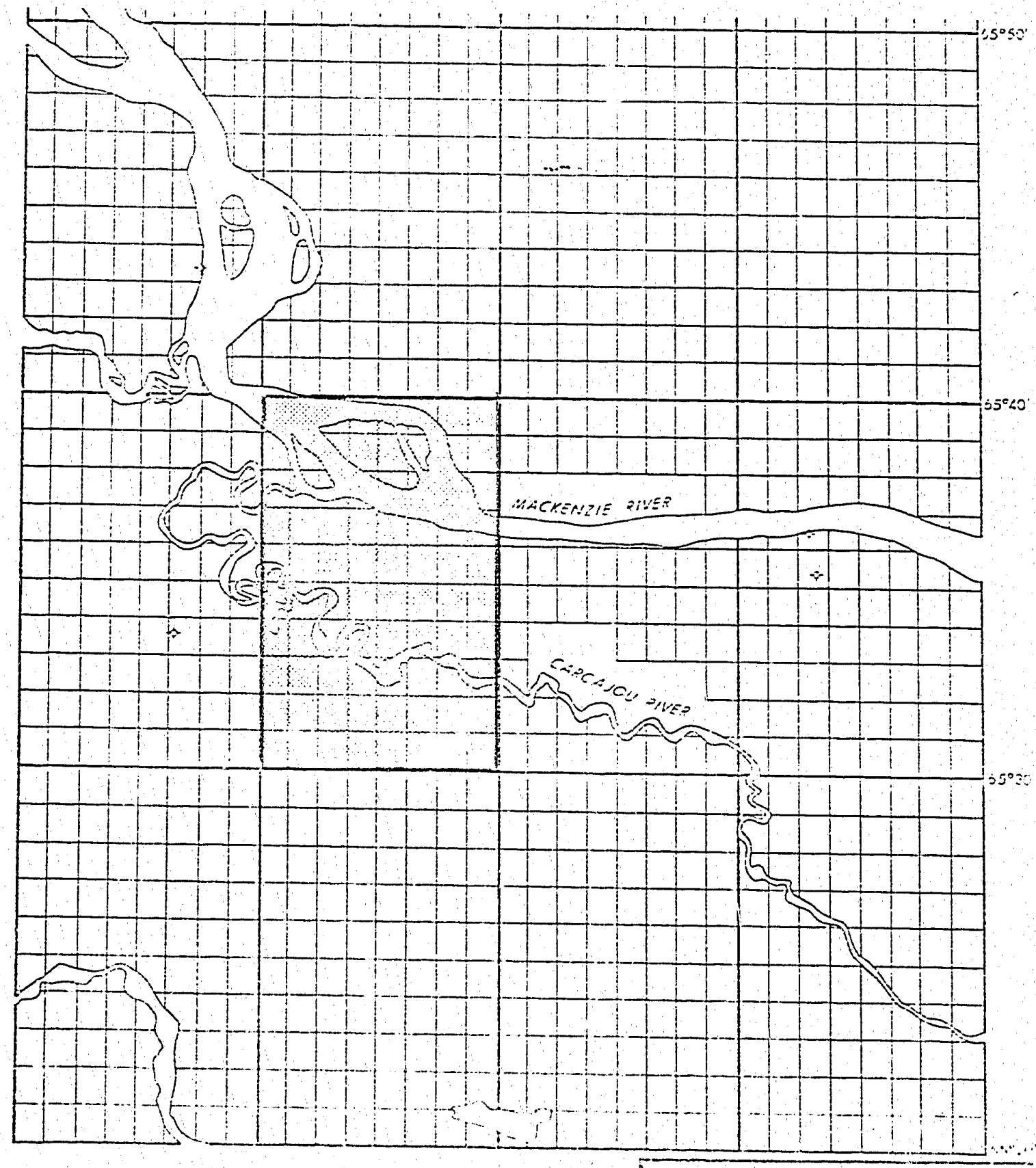
LEASES COVERED : GROUP L-54
GOV'T PROJECT No.: 7-9-6-73-7
FILE No. : N72B108

REPORT SUBMITTED OCTOBER , 1973

BY

R.V. CASS

TABLE OF CONTENTS



TRANS-PRAIRIE PIPELINES, LTD.

CARCAJOU RIVER AREA, N.W.T.

SCALE: 1" = 4 MILES

CARCAJOU MARINE SURVEY

This survey was shot for Trans-Prairie Pipelines by a Teledyne crew contracted to Imperial Oil Limited and using two boats leased from Kaps Transport, the Aurora Surveyor and the Aurora Explorer. This survey was shot in late June and early July, 1973 on the Mackenzie River on both sides of Axel Island.

FIELD PROCEDURES

The boats were both shallow-draft diesel-powered craft, 90' x 24' in size. Shooting equipment consisted of six gas exploders, set off simultaneously, utilizing a mixture of propane and oxygen. Six "pops" were shot at each shotpoint location, except for the first 49 shotpoints where nine "pops" were recorded at each shotpoint. For recording the energy, a 12-group bottom-drag detector cable was used which fed into a DFS III recorder which incorporated the SEG-A tape format.

Field procedures involved proceeding upstream pausing at each shotpoint while six or nine "pops" were shot and recorded, with the captain attempting to hold the boat steady against the current. During this pause, the cable should have sunk to the bottom of the river and, ideally, would be still, thus minimizing towing noise. Current noise would have been less if shooting had been done in a downstream direction, but then it would have been difficult to maintain position of boat and cable while shooting.

Where nine "pops" per shotpoint were employed, the shotpoint spacing was 200 feet, resulting in a 3-fold CDP stack. When it was decided to increase the stack multiplicity to 6-fold, the number of "pops" per shotpoint was decreased to six to conserve oxygen which was in short supply.

Line R-1, located in the main channel north of Axel Island, was shot first. At times the current was very strong making progress between shotpoints rather slow and increasing the noise level. Before shooting Line R-2, the channel was tested for navigability, with difficulty encountered at the west end of Axel Island where the boat grounded twice before sufficient depth of water was found. No difficulties were encountered while shooting the line except where leaving and re-entering the main channel where the cable was pulled out of line by the stronger current. Each of the "pops" at a shotpoint were recorded separately instead of being summed before being put on tape.

DATA PROCESSING

The data were processed by Digitech. Two sets of sections were prepared, one with a display scale of 8 tracks per inch horizontally and 7.5 inches per second vertically; the other with a scale of 24 tracks

per inch horizontally and 3.5 inches per second vertically. An attempt was made to match the existing land shooting by applying a correction designed to replace the water with a material of 10,000 feet per second velocity and then adjusting to a datum of 500 feet above sea level using an elevation correction velocity of 10,000 feet per second.

Machine procedures can be listed as follows:

- D to D conversion including vertical summation of six or nine "pops"
- Statics
- Trace Gather
- NMO
- Digital Filter
- First-break Mute
- Stack
- Coherency Scaling
- Display

STATISTICAL DATA

Dates of Operation

June 29	Boats departed from Norman Wells late in the afternoon
30	Arrived at project area and commenced shooting
July 1	Finished Line R-1 and began Line R-2
2	Finished Line R-2 and departed downstream

Production

Number of shotpoints -- 880

Number of "pops" -- 4,986

Number of miles of subsurface coverage -- 17.6

Days worked -- 2.25

Average daily production -- 7.8 miles

Equipment

Two barge-bottom diesel-powered boats 90' x 24' with super structures for accommodation and feeding of crew and seismic personnel

One diesel-powered drum for storing, laying out, and retrieving the cable

Six gas exploders together with the associated lines, regulators, etc. for controlling and exploding the gas mixture

One set of DFS III recording equipment

Motorola RPS system including transponders for deployment on shore

One optical range finder

Personnel

Ship's Crews	--	Skippers	2
		Mates	2
		Engineers	2
		Deck Hands	5
		Cooks	3
Seismic Crew	--	Party Manager	1
		Observers	2
		Jr. Observers	2
		Shooters and Helpers	8
Navigators (sub-contracted surveyors)			3

Navigation

D.O.T. navigation charts and markers

Electronic positioning method for measuring off shotpoint intervals

Range finder for distances to shore line

Conditions

Weather clear and warm, becoming overcast on July 1

Enclosures

- Seismic sections for Lines R-1 and R-2 (condensed)
- Kee Scarp horizon map
- Kee Scarp to Hume interval map

DISCUSSION OF MAPS AND SECTIONS

The data quality was much poorer than anticipated, principally because the shot energy was frequently insufficient to overcome the noise. As a result, there is no reflection which is continuous throughout. The Hume and Kee Scarp reflections can be correlated on parts of the two lines although the latter is frequently phantomed. In spite of this, the picture as presented on the two enclosed maps is considered to have a fair degree of reliability. Incorrect removal of the effect of permafrost on the land data would create a mis-tie between it and the river data. If the mis-tie exists, its effect can be minimized by subtracting .020 seconds from the river data and recontouring. Doing this enlarges the areal extent of the high feature, leaving everything else virtually unaffected.

The new data confirmed the previous results which showed that the north end of Line N-4 is the highest point on the structure. Line R-1 portrays a reversal north of this high point before the horizons rise steeply towards the north side of the river. Line R-2 drops off to the west and the interval is perhaps thickest in this vicinity.

The structure appears to be an extension of the Carcajou ridge. A predominantly tight Kee Scarp outcrops at the crest of this ridge east of our project. For the play to be a valid one, the Kee Scarp must be porous on the farmout land but become tight near the east boundary. Whether this is actually the case can be determined only by drilling. Choosing a drilling location will involve a compromise, since locally thinner reef values exist at the highest point on the structure.

LEGEND

- ? - Data quality poor
- ≠ - Value perhaps higher or lower
- ? - No value could be picked
- N.S. - Location not shot
- ● - Value phantomed
- Fault (hatchures on downthrown side)
- ? Possible or questionable fault
- Probable fault
- Correlation break
- Correlation uncertain
- Hatchure on low side of contour

SEISMIC HISTORY

- ● SHOT BY IMPERIAL 1963
- ○ SHOT BY NORTHERN, MARCH 1973
- ■ SHOT BY IMPERIAL FOR CIGOL, JULY 1973

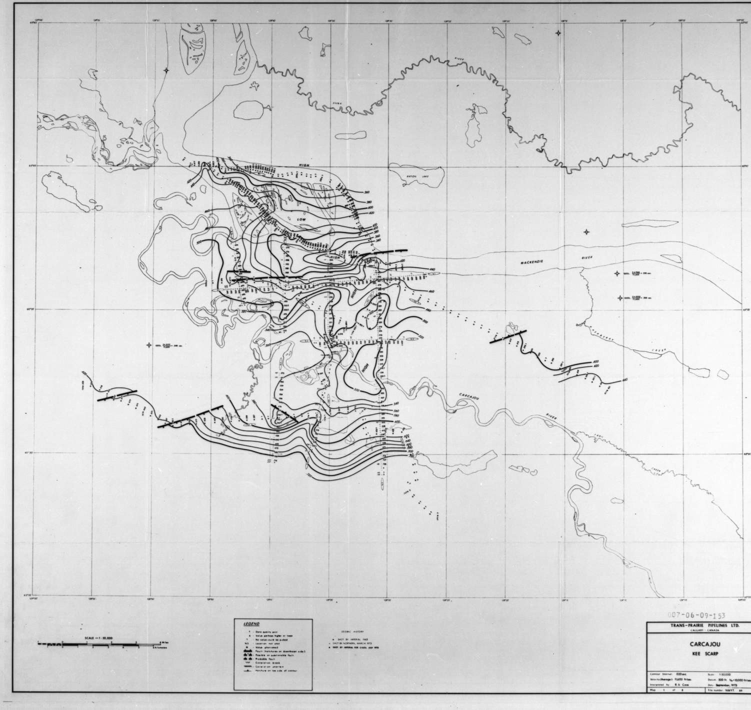
007-06-09-153

TRANS-PRAIRIE PIPELINES LTD.
CALGARY - CANADA

CARCAJOU

KEE SCARP TO HUME

Contour Interval: .010 sec.	Scale: 1:50,000
Velocity (Interval): 17,000 ft./sec.	Datum: ——
Interpreted by: R.V. Coss	Date: Sept., 1973
Map 2 of 2	File number: NWYT. 89


HIGH
LOW
HIGH
HIGH
HIGH
MACKENZIE RIVER
CARCAJOU RIVER
EATON LAKE
LEGEND
? - Data quality poor
- Value perhaps higher or lower
- No value could be picked
N.S. - Location not shot
- Value phantomed
- Fault (hatchures on downthrown side)
- Possible or questionable fault
- Probable fault
- Correlation break
- Correlation uncertain
- Hatchure on low side of contour
SEISMIC HISTORY
SHOT BY IMPERIAL 1963
SHOT BY NORTHERN, MARCH 1973
SHOT BY IMPERIAL FOR CIGOL JULY 1973
SCALE — 1:50,000
007-06-09-153
TRANS-PRAIRIE PIPELINES LTD.
CALGARY - CANADA
CARCAJOU
KEE SCARP
Contour Interval: .020sec.
Velocity (Average): 11,600 ft/sec.
Interpreted by: R.V. Coss
Scale: 1:50,000
Datum: 500 ft. V₀ = 10,000 ft/sec.
Date: September, 1973
Map 1 of 2
File number: NWYT 89