261

R E P O R T

ON A SEISMOGRAPH SURVEY

conducted in

NORTHWEST TERRITORIES, CANADA

NORTHEAST TATHLINA LAKE PROSPECT

f o r

NEW D. TODD BRIGGS ACCOUNT

DALLAS, TEXAS, U.S.A.

Seismograph Service Corporation of Canada

Calgary, Alberta

CONTENTS

INTRODUCTION

A reflection seismograph survey was conducted in the Northeast Tathlina Lake area, Northwest Territories, during February and March, 1956 for the D. Todd Briggs Account. The survey was conducted in order to provide additional detail on a high anomaly found by refraction shooting in this area, and to attempt to establish a suitable drilling site before Spring "breakup".

DISCUSSION OF RESULTS

General

The shooting began during the middle of February with two seismic crews working on the same prospect for the first week. Thereafter the work was continued through March by one crew. Instruments used for shooting this prospect were manufactured by Houston Technical Laboratories and were equipped with Magnadisc. One set of Seismograph Service Corporation AAC instruments recorded in parallel with the Magnetic Truck during most of this

time. Record quality varied from poor to fair except in the extreme northeast portion of the area where reflection quality became quite questionable.

Two time structure maps and one time interval map are submitted with this report. They are designated as:

Tentative Slave Point
Tentative Pre-Cambrian
Tentative Slave Point to Tentative Pre-Cambrian

Detailed Discussion

Tentative Slave Point

The reflection tentative identified as originating from the Slave Point is the best reflection mapped and is believed to be most representative of a possible producing horizon in this area. The most important and the only well defined feature on this map is a long high anticlinal nose which is first noted in the northeast part of the area. It plunges some 8 miles across the prospect in a general southwesterly direction, through the Briggs Tathlina Lake #1 Well, to a closed high feature in the south central portion of

the area. There the direction of the high trend changes and it continues some 8 miles to the west to the limits of the prospect.

The highest point of the closed feature is near Shot Point 101 on Line T-A. It is felt that a minimum of 10 milliseconds of closure has been established in all directions. Although the crest is down dip from the dry hole, the closure makes the feature attractive.

What is believed to be good seismic evidence of a reef edge has been observed on Line T-12 about a mile west of Briggs Tathlina Lake No. 1. However, no closure has been established to the northeast of this location.

In the extreme northeastern portion of the area reflection quality deteriorated markedly. The fault postulated, downthrown to the south, is based on reflection correlations in a bad record area, and, therefore, the precise nature of the northeast limit of the principal anticline is not definite.

Tentative Pre-Cambrian

The contour interpretation of the data identified as originating from the Pre-Cambrian is very similar to the Slave Point

interpretation. The large anticlinal nose follows the same trend and provides the same closure. The area of greatest interest remains the closed high near Shot Point 101 on Line TA. The fault in the northeastern portion is also shown on this map, although reflection quality makes the fault questionable.

Slave Point - Pre-Cambrian

The time interval between the Slave Point and the Pre-Cambrian levels shows a general thinning along the anticlinal trend discussed above. No regional change in time interval was noted.

CONCLUSIONS and RECOMMENDATIONS

It is believed that the closed high feature in the south central portion of the area warrants a drill test. Other features implied by the contour interpretation should be better defined by additional seismic or other control before drilling.

Respectfully submitted,

Seismograph Service Corporation
of Canada

By - J. G. Bunker - Party Chief

By L. G. Morris

L. G. Morris - Supervisor

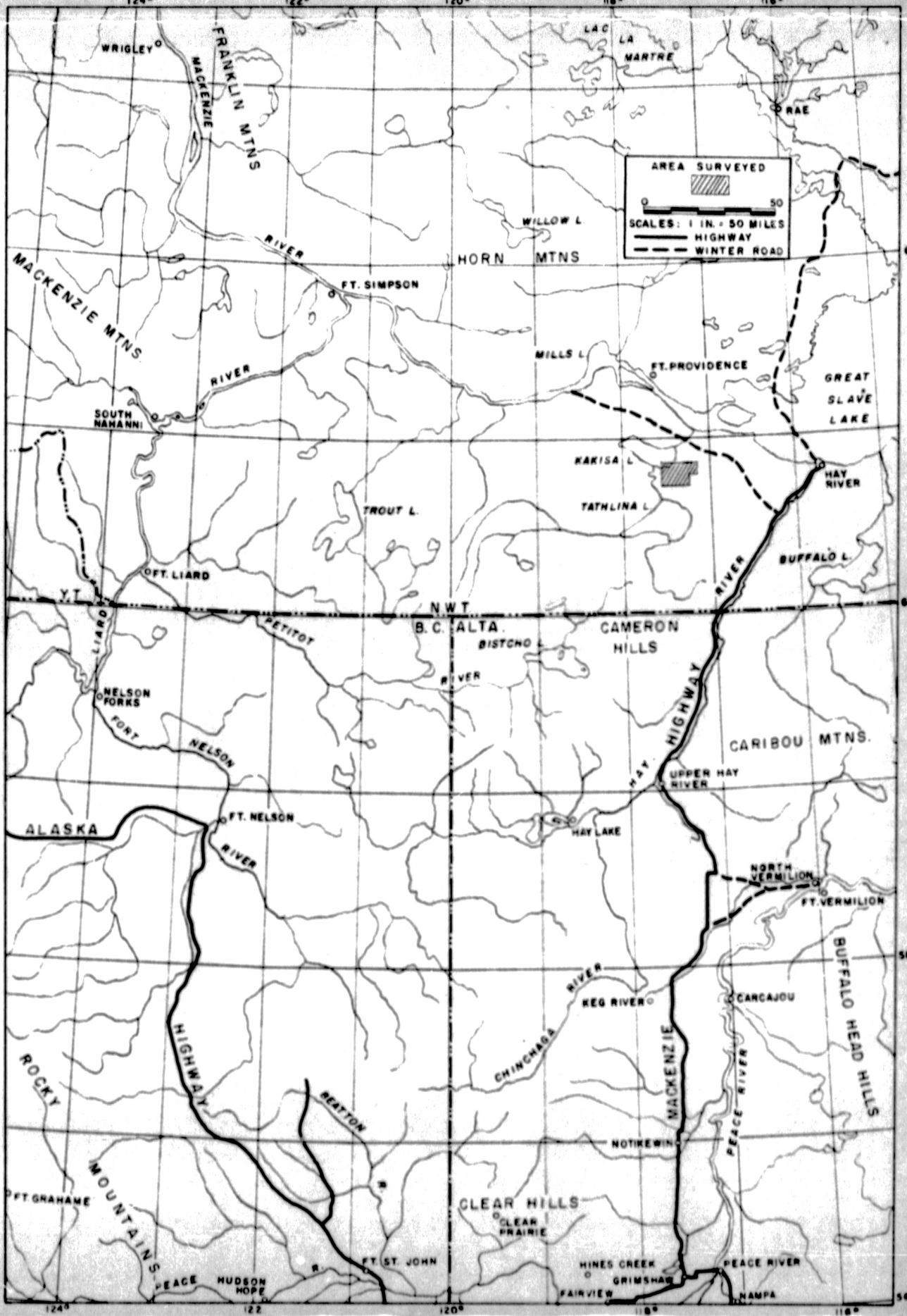
May 1, 1956

APPROVED:

By H C Bickel

H. C. Bickel - Vice-President

LGM/pk


124°
122°
120°
118°
116°
WRIGLEY
MACKENZIE
FRANKLIN MTNS
LAC LA MARTRE
RAE
AREA SURVEYED
0 50
SCALES: 1 IN. = 50 MILES
HIGHWAY
WINTER ROAD
WILLOW L.
RIVER
HORN MTNS
62
MACKENZIE MTNS
FT. SIMPSON
MILLS L.
FT. PROVIDENCE
GREAT SLAVE LAKE
RIVER
SOUTH NAHANNI
KAKISA L.
HAY RIVER
TROUT L.
TATHLINA L.
BUFFALO L.
FT. LIARD
Y.T.
N.W.T.
60°
LIARD
PETITOT
B.C.
ALTA.
BISTCHO L.
CAMERON HILLS
RIVER
NELSON FORKS
FORT NELSON
HAY RIVER HIGHWAY
CARIBOU MTNS.
UPPER HAY RIVER
ALASKA
FT. NELSON
HAY LAKE
RIVER
NORTH VERMILION
FT. VERMILION
58°
KEG RIVER
CARCAJOU
CHINCHAGA RIVER
HIGHWAY
ROCKY
BEATTON R.
MACKENZIE
PEACE RIVER
BUFFALO HEAD HILLS
NOTIKEWIN
FT. GRAHAME
MOUNTAINS
CLEAR HILLS
CLEAR PRAIRIE
FT. ST. JOHN
HINES CREEK
PEACE RIVER
GRIMSHAW
PEACE
HUDSON HOPE
FAIRVIEW
NAMPA
56°

APPENDIX II

PHYSIOGRAPHY

Terrain:	**Muskeg and timber land**
Population:	**None**
Culture:	**None**
Drainage:	**Poorly drained to north into Kakisa Lake**
Soil:	**Muskeg**
Weather:	**Cold with drifting snow**
Roads:	**Bulldozed trails**
Access to Area:	**Via Mackenzie Highway to Mile 28 south of Hay River, Northwest Territories then west via bulldozed trails to camp.**
Traverse Difficulties:	**Rough trails**

APPENDIX III

GEOLOGY

Surface Formation:	Pleistocene Glacial Deposits with Devonian outcrops.
Subsurface Log:	None
Unconformities:	Unknown
Regional Dip:	Estimated southwest
Potential Producing Horizons:	Presqu'il
Type Structures Expected:	Reefs, fault traps, anticlinal structures
Well Control:	None

APPENDIX IV

OPERATION METHODS

Method Used:	Continuous Reflection Profiling Straddle spreads
Hole Spacing:	1320 feet
Cross Spreads:	None
No. of Channels:	24
Spacing of Geophone Stations:	110 feet
No. of Geophones per Channel:	1
Distance from Shot Hole to Adjacent Geophones:	110 feet
Relation of Far Geophones to Interlock Holes:	At interlock hole
Shot Hole Depths:	Range: 10 - 180 feet Normal: 40 feet
Formations Encountered:	Muskeg, clay, sand, gravel, shale and limestone
Dynamite Charges:	Range: 5/8 to 15 pounds Normal: 1 1/4 to 2 1/2 pounds
Elevation Survey:	Control: 6th Meridian and Contract Surveyors Accuracy: All shot points on closed traverses properly tied in.
Operational Difficulties Encountered:	Rough trails, difficult drilling, paralleling of recording trucks.

GEOPHONE AND SHOT HOLE ARRANGEMENT

LEGEND

Shot Hole Under Test

Adjoining Shot Hole

Geophone and Number

Line of Profile

APPENDIX V

OPERATION STATISTICS

Basic Crew:

Crew Headqqarters:	Camp
Starting Date:	February 17, 1956
Completion Date:	March 28, 1956
No. of Working Hours:	560.5
No. of Profiles Shot:	852
No. of Linear Miles of Profile:	112 1/2
Dynamite Used:	1731 3/8 pounds
No. of Caps Used:	1069

Drilling:

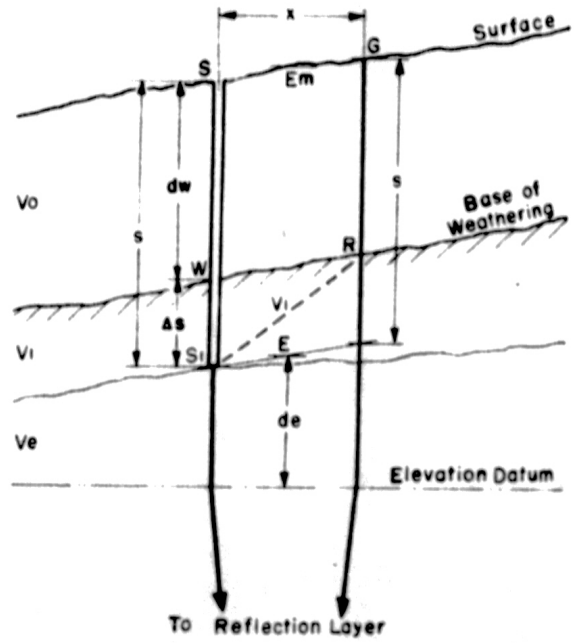
No. of Drills Used:	4
No. of Drill Hours:	1658.1
No. of Holes Drilled:	430
Total Footage Drilled:	23,706
Casing Used:	None
Bran Used:	8850 pounds
Mud Used:	17,875 pounds

APPENDIX VI

CALCULATION and INTERPRETATION METHODS

Record Quality:	Poor to good
Type Correction Used:	Modified Uphole
Other Corrections Worked:	Normal uphole - Summation Weathering
Last Trace Ties:	Surface to surface
Elevation Datum:	+950 feet
Weathering Velocity (Vo):	2500 feet per second
Elevation Velocity (Ve):	14,000 feet per second
Horizontal Velocity (Vh):	Variable
Horizons Mapped:	
Tentative Slave Point	
Time Range	372 to 476 milliseconds
Tentative Pre-Cambrian	
Time Range	457 to 555 milliseconds

MODIFIED UP-HOLE CORRECTIONS



LEGEND

S – SHOT POINT
G – GEOPHONE LOCATION
Em – AV. ELEVATION OF S AND G
E – Em – S
x – DISTANCE FROM S TO G
dw – THICKNESS OF WEATHERING AT S
s – DEPTH OF CHARGE
Δs – s – dw
de – (Em – s) – ELEVATION DATUM
Vo – AV. VELOCITY IN WEATHERED LAYER
Vi – AV. VELOCITY IN SECOND WEATHERED LAYER
Ve – ELEVATION VELOCITY
tr – REFRACTION TIME SiRG
ts – UP-HOLE TIME RECORDED
$\bar{t}_s$ – UP-HOLE TIME CALCULATED
Δt_h – HORIZONTAL CORRECTION

DETERMINATION OF d_w AND Δt_h VALUES

$$d_w = (V_i\, t_s - s)\,\frac{V_o}{V_i - V_o}$$

$$\Delta t_h = \frac{1}{V_i}\,(S_iR - S_iW) = \frac{1}{V_i}\,(\sqrt{\Delta s^2 + x^2} - \Delta s)$$

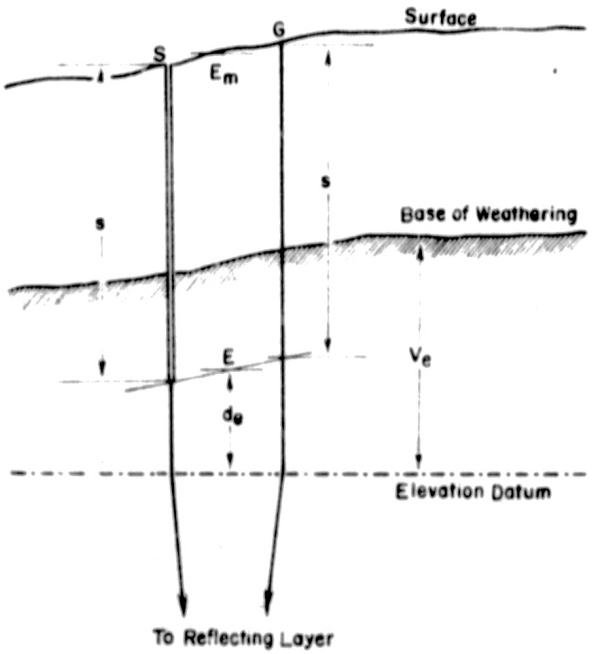
CORRECTIONS

Calculated Up-Hole Correction $\quad \bar{t}_s = t_r - \Delta t_h$

Elevation Correction $\quad t_e = \frac{2\,d_e}{V_e}$

Total Corrections $\quad \overline{\Sigma t} = t_s + t_e$

NORMAL UP-HOLE CORRECTIONS



LEGEND:

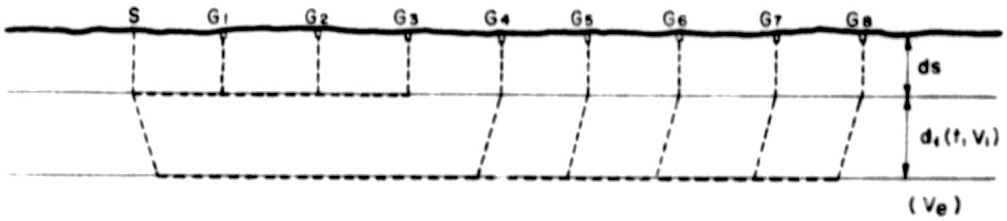
S = Shot Point
G = Geophone Location
E_m = Av. Elevation of S and G
$E = E_m - s$
s = Depth of Charge
$d_e = (E_m - s)$ - Elevation Datum
V_e = Elevation Velocity
t_s = Uphole Time
t_r = Recorded Reflection Time
t_c = Reflection Time Corrected to Datum

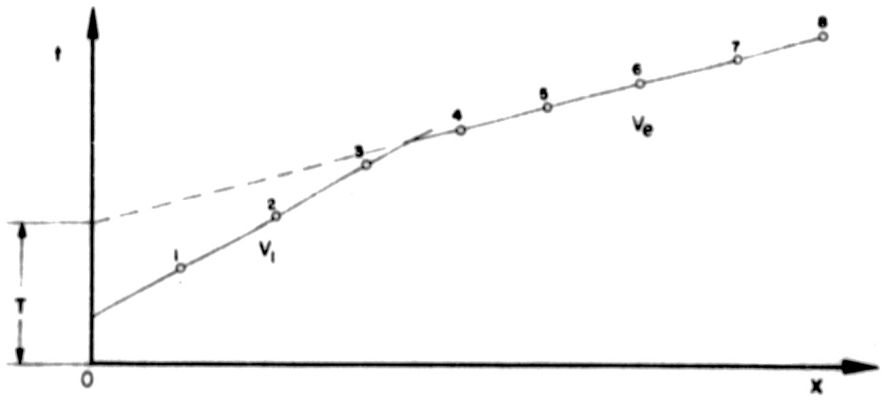
CORRECTIONS

TOTAL CORRECTION, $\Sigma t = \frac{2d_e}{V_e} + t_s$

CORRECTED TIME, $t_c = t_r - \Sigma t$

WEATHERING CALCULATION FOR DRIFT CORRECTION





GENERAL REFRACTION FORMULA FOR (N-L) LAYERS

$$t = \frac{2d_1}{V_1 V_n}\sqrt{V_n^2 - V_1^2} + \frac{2d_2}{V_2 V_n}\sqrt{V_n^2 - V_2^2} + \frac{2d_{n-1}}{V_{n-1} V_n}\sqrt{V_n^2 - V_{n-1}^2} + \frac{X}{V_n}$$

$$T = \frac{2d_1}{V_1 V_e}\sqrt{V_e^2 - V_1^2}$$

$$T - t_0 = \frac{2t_1}{V_e}\sqrt{V_e^2 - V_1^2}$$

BASIC REFRACTION FORMULA FOR SURFACE SHOT, WHERE T = INTERCEPT OF THE V_e REFRACTOR.

SIMILAR FORMULA FOR SHOT AT DEPTH ASSUMING VERTICAL TRAVEL IN MATERIAL ABOVE SHOT LEVEL. WHERE t_1 = VERTICAL TRAVEL TIME FROM SHOT TO V_e VELOCITY BED.

$$2t_1 = \frac{(T - t_0)\,V_e}{\sqrt{V_e^2 - V_1^2}}$$

DRIFT CORRECTION

$$= 2t_1 \frac{V_e - V_1}{V_e}$$

$$= \frac{(T - t_0)}{\sqrt{V_e^2 - V_1^2}} \cancel{V_e} \frac{V_e - V_1}{\cancel{V_e}}$$

$$= \frac{(T - t_0)}{\sqrt{V_e - V_1}} \frac{\sqrt{V_e - V_1}}{\sqrt{V_e + V_1}} \sqrt{V_e - V_1} = T - t_0 \frac{\sqrt{V_e - V_1}}{\sqrt{V_e + V_1}}$$

APPENDIX VII

FIELD MATERIAL SUBMITTED SEPARATELY

All Records for the Survey

Large Cross Sections

Plane Table Sheets

Surveyor's Field Notes

Driller's Reports

Calculation Book containing:

- Velocity Determinations
- Time-Depth Conversion Tables
- Weathering Graph Sheets
- Summation Weathering Forms
- Elevation Map
- Work Cross Sections
- Observer's Reports
- Shooter's Reports