SEISMIC SURVEY

TROUT LAKE AREA, N.W.T.

For

UNION OIL COMPANY OF CANADA LIMITED

By

Independent Exploration Company

(18)

REPORT

on a

SEISMIC SURVEY

of

THE TROUT LAKE AREA

NORTHWEST TERRITORIES

CANADA

60°40' to 61°00' LATITUDE

120°00' to 120°45' LONGITUDE

by

INDEPENDENT EXPLORATION COMPANY (CANADA) LTD.

PARTY 561

from

MARCH 2, 1966

to

MARCH 25, 1966

Submitted by:

James Barron - Party Chief

June 1966

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Trout Lake

1. Surface Topography
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3. Isochron - First Limestone to Utahn (Time Map)
4. Structure - Top of Carbonate (Time Map)
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I. SUMMARY AND CONCLUSIONS

This survey has shown the location of the facies front of the Slave Point - Elk Point sequence quite definitely on the three lines which crossed over the front. Additional control may show local changes in the position of this facies front which may create favourable structural conditions.

The structural anomaly located in the southwestern part of Grid Area, North 61°00', West 120°15' appears quite significant at this time. The possibility

exists that this feature may be an expression of Presqu'ille development in the underlying formations. Multiple reflection interference with the Slave Point data obtained in this area is quite strong, and future seismic programs in this specific area should be planned in such a way that maximum attenuation of the multiple reflections can be achieved.

II. INTRODUCTION

The following is a final report on a seismic survey conducted in the Trout Lake Area, Northwest Territories, Canada, by Independent Exploration Company (Canada) Ltd. This area is located between 60°40' and 61°00' Latitude and 120°00' and 120°45' Longitude.

The crew and equipment was moved into the area through Fort Nelson, B.C. An access road cleared by other seismic crews was used part of the way, and bulldozers under contract to I.X. Co. opened up the remaining few miles and cleared a campsite and airstrip in the approximate center of Grid Area 61°00', 120°15'.

The work was carried out during the period March 2, 1966 to March 25, 1966.

III. GEOLOGY

The area covered by this survey lies near the western edge of the Tathlina Pre-Cambrian high. The

shooting program was planned in such a way that several of the seismic lines passed over the edge of the facies front of the Slave Point - Elk Point sequence. At this front, the carbonates to the south pass fairly abruptly to shales to the north. There is much evidence that, on the carbonate side of the front, prolific organic growth occurred, which in places resulted in the formation of reef structures. The possibility also exists of Presqu'ille development in the older underlying formations.

IV. ATTACHMENTS

A. Structure Maps

1. Structure - Top of Carbonate - Trout Lake
2. Structure - Top of Carbonate - Redknife

B. Isopach Maps

1. Isochron - First Limestone to Utahn - Trout Lake
2. Isochron - First Limestone to Utahn - Redknife
3. Isochron - Utahn to Top of Carbonate - Trout Lake
4. Isochron - Utahn to Top of Carbonate - Redknife

C. Other Maps

1. Surface Topography - Trout Lake
2. Surface Topography - Redknife
3. Top of Wabamun and First Limestone - Trout Lake
4. Top of Wabamun and First Limestone - Redknife

V. PROCEDURES

A. Survey Objective

This survey was conducted in order to establish the precise location of the facies front of the Slave Point - Elk Point sequence, and to determine if any favourable drilling locations were present in the area. The presence of Presqu'ille development is suspected in the area, and the data should also be examined for this possibility.

B. Reflections Mapped

1. Top of Carbonate - from field records.
2. First Limestone - from stacked record sections.
3. Utahn - from stacked record sections.

C. Computing Procedures

Records were labelled in a standard manner. Refraction breaks were plotted to true horizontal scale on cross section paper. The thickness of drift was computed using a formula supplied by Union Oil.

$$d_2 = \frac{V_2}{2\,\mathrm{Cos}\,i_{23}}\left[t_{13} - \frac{(d_1 - D_s)\,\mathrm{Cos}\,i_{23}}{V_2} - \frac{d_1\,\mathrm{Cos}\,i_{13}}{V_1}\right] \qquad \mathrm{Sin}\,i_{23} = \frac{V_2}{V_3}$$

A standard uphole computation was made for every sixth shot point, with the additional L.V.L. corrections also being made where applicable.

$$T_c = \begin{bmatrix} -T_{um} \\ -(E_s - Ed_2) / V_2 \\ -(Ed_2 - ED) / V_3 \end{bmatrix} - \begin{bmatrix} (E_s - Ed_2) / V_2 \\ + \\ (Ed_2 - ED) / V_3 \end{bmatrix}$$

Records were counted in raw time with the total correction being applied to the reflections picked on the records.

D. Record Sectioning Procedure

A study of the field data obtained was made in order to develop a Normal Move-out curve for the area. Pen sections were made with the appropriate Normal Move-out corrections applied. Stacked record sections were then prepared from the pen sections. The only good consistent reflection apparent on the records was a reflection originating from the top of the Slave Point - Elk Point Carbonate sequence. This reflection was flattened to a time of .700 seconds on the stacked sections.

The Utahn reflection, the First Limestone reflection, and in some places the Wabamun reflection,

showed up quite well on the stacked record sections. Corrections were then made to the Utahn reflection (flattening it to a datum of .400 seconds) and another set of record sections was produced.

VI. DISCUSSION OF RESULTS

The Surface Topography map prepared for this area shows the surface rising to the southwest at a fairly uniform rate of 35 feet per mile.

The surface is drained to the northeast by a network of small creeks which are tributaries of the Trout River. Some patches of muskeg are present in the area, but no great difficulties were encountered due to the frozen condition of the ground.

Old lines cleaned out, new lines cut, and the locations of the campsite and air strip constructed are also shown on the Surface Topography map.

The Top of Wabamun and First Limestone map is based on refraction computations made from the record data obtained.

The first high velocity refractor encountered in the northeast part of the area surveyed tied very closely with the First Limestone marker indicated on the logs of the Briggs Trout River No's. 4, 2 and 6 wells. This refraction had a horizontal velocity of 17,000 feet per second.

Over the rest of the area surveyed, a shallower refractor with a horizontal velocity of 14,000 ft. per second was present. The depths computed for this layer tie very closely with the Top of Wabamun markers indicated on the logs of the Briggs Trout River No's 1 and 5 wells to the southwest.

The abrupt disappearance of this refractor in the northeast part of the area suggest the existence of a Wabamun escarpment approximately 250 feet high lying along a northwest - southeast line running through the approximate junction of the AL, AP and AM lines. Indications of buried low velocity material were noted on some of the refraction profiles plotted for the north end of the AL line, and also on the AM line northeast of the postulated Wabamun escarpment.

The First Limestone refractor was observed on the profiles obtained from S.P. AL-78 and AL-90 and a three layer method was used to determine the depth to this formation. Calculations show a Top of Wabamun to First Limestone thickness in excess of 300 at these locations.

The Tops of both the Wabamun and First Limestone have been contoured on the same map, with a broken contour line being used to show the probably First Limestone values where it is overlain by the Wabamun formation.

The Structure - Top of Carbonate map was prepared from data obtained from the field records. All times have been corrected to a datum of +1500 feet. A correctional velocity of 15,300 ft. per sec. was used for data obtained on the northeast side of the indicated Wabamun escarpment, and correctional velocity of 12,600 ft. per second was used for the remainder of the area. A contouring discrepancy occurred along the line where this change was effected. For this reason a break has been shown in the contouring on the map along the same line as the Wabamun escarpment as shown on the map previously discussed.

At the south end of the AJ line, the spread used ($\frac{1}{2}$ mile) was not long enough to accurately determine the thickness of drift for the last three miles surveyed. Time values showing south dip at a rate of .008 seconds per mile have been arbitrarily assigned to the control points involved. These values have been bracketed on the map.

The Structure - Top of Carbonate map shows fairly steep northeast dip coincident with the Slave Point - Elk Point facies change known to exist between the Briggs Trout River number 2 and number 6 wells located in Section 18 of Grid Area North 61°90' West 120°15'.

Similar dip is shown on the north end of the AJ line occurring one half mile south of Briggs Trout River number 5 well which was drilled on the shale side of the

facies front. These anomalous areas are supported by a marked change in the Utahn to Top of Carbonate interval on the stacked record sections. A similar condition was noted on the record section for the AL line between shot points 36 and 42. This change occurs in the vicinity of the previously discussed near surface lithology change and no reliable time values could be assigned for these locations.

A shallow low trend is shown two miles south of and parallel to the facies front shown on the map.

High values are shown at shot points AJ 72 and AJ 78 located approximately North 60°50' and West 120°30'. These values are as high as those shown along the high trend coincident with the limestone to shale facies front shown to the north, but since they are regionally downdip, a fairly prominent feature is indicated. Relatively high values on the AL line to the east suggest a probable east - west alignment of this feature.

The Isochron - Utahn to Top of Carbonate values were obtained from the record sections prepared for this area.

This Isochron shows abrupt thinning to the south coincident with the Slave Point - Elk Point facies front shown on the Structure - Top of Carbonate map.

Very marked thinning is shown over the structural feature located in the southwestern part of Grid Area North

61°00', West 120°15'. It should be noted however that the two thinnest contours shown are based on the value obtained for shot point AJ 72. Data in this area is influenced considerably by multiple reflections and this value is therefore somewhat unreliable.

The Isochron - First Limestone to Utahn was also prepared from record section data. This map shows a small amount of sectional thinning over the high feature coincident with the facies front shown on the Structure - Top of Carbonate. Little or no interval change is noted over the structural high located in the southwestern part of Grid Area North 61°00', West 120°15'.

VII. RECOMMENDATIONS

Structural highs along the edge of the Slave Point - Elk Point facies front have been tested by the Briggs Trout River number 1 and number 2 wells. Additional control along this facies change may reveal embayments in the alignment of front which may indicate structural and stratigraphic conditions favourable for hydrocarbon accumulation.

More work should be programmed over the anomaly shown in the southwestern part of the area surveyed to confirm its existence and magnitude. Some thought should

be given to a shooting procedure designed to attenuate multiple reflection interference which occurs at a time coincident with the Slave Point - Elk Point reflections in this area.

Respectfully submitted,

INDEPENDENT EXPLORATION COMPANY (CANADA) LTD.

James Barron
Party Chief

VIII. APPENDIX

Statistical Report:

1.	Commencement Date of Work:	March 2, 1966
2.	Date of Completion:	March 25, 1966
3. a.	Field recording time:	248
b.	Moving and holiday time:	112
c.	Total crews hours a. and b.:	350
4. a.	Number of locations recorded as split profiles:	510
b.	Number of locations recorded as weathering profiles:	-
c.	Number of locations recorded as single-end profiles other than weathering profiles:	-
5. a.	Number of shots taken:	639
b.	Average number of shots per location:	1.252
c.	Total dynamite used:	2350 lb.
d.	Average dynamite per shot:	3.68 lb.
* 6.	Number of Locations Recorded Per Ten Hour Day:	20.6
7.	Total Miles of Subsurface Coverage obtained:	43.2
8.	Miles of Subsurface Coverage Per Ten Hour Day:	1.740
9.	Drill # Gyro (Auger)	
a.	Field Time:	567.5
b.	Moving & holiday time:	130.0
c.	Total time (a) & (b):	697.5
d.	Total footage:	11,832
e.	Footage per ten hour day:	209.0

Drill # Hayter (Winterwiess)

a. Field Time: 564.0

b. Moving & holiday time: 149.0

c. Total time (a) & (b): 713.0

d. Total footage: 7,303

e. Footage per ten hour day: 130.0'

Drill # Foothills (Mayhew 1000)

a. Field time: 419.5

b. Moving and holiday time: 68.5

c. Total time (a) & (b): 488.0

d. Total footage: 5180'

e. Footage per 10 hour day: 124'

Drill # Shibley (Mayhew 1000)

a. Field time: 230.0

b. Moving and holiday time: 64.0

c. Total time (a) & (b): 294.0

d. Total footage: 2590'

e. Footage per 10 hour day: 112.5'

10. Dozing:

a. Hours cutting 464.5 Miles 37.5

b. Hours cleaning 271.0 Miles 25.5

c. Total hours 709.5 Total Miles 62.0

11. a. Maximum surface elevation: +983.0

Minimum surface elevation: +1604.0

Field Equipment and Technique:

1. Type of instruments and Tape Used: Modified Century Instruments S.I.E MR-4 FM Tape Recorder
2. Geophones Type: HS-J 20 c.p.s.
3. Location to Location Distance: 220 feet
4. Offset to First Group: 110 feet
5. Group Interval: 120 feet
6. Number of Geophones Per Group: 9

   Roll-Along Shooting method was used to obtain 600% Sub Surface Coverage
7. Geophone-In-Group Arrangement: 9 phones 15 feet apart in line
8. Number of Holes Per Location: 1
9. Hole Spacing: 440 feet
10. Average Hole Depth: 40 feet

11. Recording Procedure: (Recording tape-filter, A.G.C., etc.)
    (Playback-filter, A.G.C., etc.)

    Shots Recorded on tape with filter setting 20(1) - 120(1)

    A.G.C. - Fast

    Gain Setting - 18 db

    No Amplified Playbacks made

    Record Sections made on filter setting 27(1) - 65(1)

12. Survey Procedure: (Instrument used, take off control, etc.)

A. Wilde T1-A Theodolite was used.

Take off control was obtained from wellsite locations and elevations in area.

Azimuth was determined from polar observations.

(Latitude and departure sheets included).

SUB CONTRACTED EQUIPMENT AND SERVICES

Services	Name	Address	Evaluation
Drilling	Gyro Drilling	Calgary	Satisfactory
Drilling	Hayter Drilling	Estavan, Sask.	Unsatisfactory
Drilling	Foothills Drilling	Calgary	Unsatisfactory (low footage rate)
Drilling	Shibley Enterprises	Calgary	Unsatisfactory (low footage rate)
Water Truck	Ingram	Calgary	Satisfactory
Bulldozing	Brown Construction	Olds, Alberta	Satisfactory
Camp Catering	Fortier & Associates	Edmonton	Satisfactory
Camp Rental	Heiland and Texaco	Calgary	Satisfactory

Note: Long Water Haul for Drills

DRILLERS LOG

LINE &
SHOT POINT NO.

AM

S.P.						
	2	0 - 15	Muskeg	15 - 40	Clay & Boulders	
	3	0 - 15	Muskeg	15 - 40	Clay & Boulders	
	4	0 - 13	Muskeg	13 - 40	Clay & Boulders	
	5	0 - 40	Clay & Boulders			
	6		Boulders			
	7	0 - 40	Clay & Boulders			
	8	0 - 40	Clay & Boulders			
	9	0 - 40	Clay & Boulders			
	10	0 - 40	Clay & Boulders			
	11	0 - 40	Clay & Boulders			
	12	0 - 40	Clay & Boulders			
	13	0 - 40	Clay & Boulders			
	14	0 - 40	Clay & Boulders			
	15	0 - 40	Clay & Boulders			
	16	0 - 18	Gravel	18 - 40	Clay & Boulders	
	17	0 - 15	Gravel	15 - 40	Clay & Boulders	
	18	0 - 15	Brown Clay	15 - 25	Gravel & Boulders	
	19	0 - 40	Clay & Boulders			
	20	0 - 7	Muskeg	7 - 40	Clay & Boulders	
	21	0 - 10	Muskeg	10 - 35	Clay & Boulders	
	22	0 - 7	Muskeg	7 - 40	Clay & Boulders	
	23	0 - 5	Muskeg	5 - 40	Clay & Boulders	
	24	0 - 40	Clay & Boulders			
	25	0 - 15	Boulders			
	26	0 - 10	Boulders	10 - 15	Clay & Gravel	
				15 - 33	Blue Clay & Boulders	
	27	0 - 20	Clay & Boulders	20 - 35	Sand	
				35 - 40	Clay & Boulders	
	28	0 - 20	Clay & Boulders	20 - 40	Sand & Gravel	
	29	0 - 10	Clay & Boulders	10 - 40	Gravel	
	30	0 - 40	Clay & Boulders			
	31	0 - 40	Clay & Boulders			
	32	0 - 40	Clay & Boulders			
	33	0 - 40	Clay & Boulders			
	34	0 - 30	Clay & Boulders	30 - 35	Gravel	
	35	0 - 40	Clay & Boulders			
	36	0 - 40	Clay & Boulders			
	37	0 - 40	Clay & Boulders			
	38	0 - 20	Gravel			
	39	0 - 15	Clay	15 - 30	Gravel & Boulders	
	40	0 - 40	Clay & Boulders			
	41	0 - 5	Muskeg	5 - 40	Clay & Boulders	
	42	0 - 5	Muskeg	5 - 40	Clay & Boulders	
	43	0 - 20	Clay & Boulders	20 - 30	Sand	30 - 40 Clay

S.P. 44	0 - 10	Muskeg	10 - 40	Clay & Boulders			
45	0 - 40	Clay & Boulders					
46	0 - 40	Clay & Boulders					
47	0 - 40	Clay & Boulders					
48	0 - 40	Clay & Boulders & Small Rocks					
49	0 - 40	Clay & Boulders					
50	0 - 5	Clay	5 - 35	Sand Gravel & Rocks			
51	0 - 10	Muskeg	10 - 25	Sand	25 - 40	Sand & Gravel	
52	0 - 40	Sand & Gravel					
53	0 - 5	Muskeg	5 - 40	Clay & Boulders			
54	0 - 12	Brown Clay	12 - 17	Rock			
			17 - 42	Blue Clay & Boulders			
55	0 - 15	Sand & Gravel	15 - 25	Clay & Boulders			
56	0 - 40	Clay & Boulders					
57	0 - 10	Muskeg	10 - 40	Clay & Boulders			
58	0 - 5	Muskeg	5 - 40	Clay & Boulders			
59	0 - 3	Sand	3 - 25	Clay & Boulders			
60	0 - 5	Clay	5 - 12	Sand	12 - 25	Clay & Rocks	
61	0 - 25	Clay Rocks & Boulders					
62	0 - 8	Brown Clay	8 - 30	Dark Blue Clay			
			30 - 105	Blue Clay & Boulders			
63	0 - 25	Clay & Boulders					
64	0 - 10	Brown Clay	10 - 25	Blue Clay & Boulders			
65	0 - 30	Clay & Boulders					
66	0 - 5	Muskeg	5 - 40	Clay & Boulders			
67	0 - 40	Clay & Boulders					
68	0 - 50	Clay & Rocks					
69	0 - 40	Clay & Boulders					
70	0 - 40	Clay & Boulders					
71	0 - 10	Brown Clay	10 - 50	Blue Clay & Boulders			

AL

S.P. 1	0 - 5	Muskeg	5 - 40	Clay & Boulders			
2	0 - 5	Muskeg	5 - 40	Clay & Boulders			
3	0 - 40	Clay & Boulders					
4	0 - 80	Clay & Boulders					
5	0 - 80	Rocks & Boulders					
6	0 - 15	Brown Clay	15 - 35	Blue Clay & Boulders			
	35 - 40	Rock	40 - 80	Blue Clay			
7	0 - 40	Clay & Gravel	40 - 80	Sandy Clay & Boulders			
8	0 - 10	Boulders	10 - 80	Clay & Boulders			
9	0 - 65	Clay & Boulders					
10	0 - 5	Muskeg, Clay & Rocks					
11	0 - 2	Muskeg	2 - 90	Clay & Rocks			
12	0 - 40	Clay & Boulders					
13	0 - 15	Brown Clay	15 - 60	Blue Clay & Boulders			
			60 - 80	Gravel			

AL

S.P. 14	0 - 5	Muskeg	5 - 60	Clay & Rocks	
			60 - 80	Sand & Gravel	
15	0 - 18	Brown Clay	18 - 25	Gravel	
	25 - 50	Blue Clay	50 - 80	Gravel	
16	0 - 2	Ice	2 - 45	Clay & Rocks	
	45 - 60	Gravel	60 - 80	Hard Sand	
17	0 - 10	Muskeg	10 - 40	Sand & Gravel	
			40 - 80	Gravel & Clay	
18	0 - 40	Clay & Rocks	40 - 80	Gravel & Sand with Rocks	
19	0 - 80	Clay & Boulders			
20	0 - 80	Clay & Boulders			
21	0 - 40	Clay & Boulders			
22	0 - 80	Clay, Rocks & Boulders			
23	0 - 40	Sandy Clay & Gravel			
24	0 - 40	Clay & Boulders			
25	0 - 10	Muskeg	10 - 30	Clay & Boulders	
	30 - 50	Gravel	50 - 80	Clay & Boulders	
26	0 - 20	Brown Clay	20 - 45	Blue Clay & Boulders	
	45 - 80	Gravel			
27	0 - 80	Clay, Rocks & Boulders			
28	0 - 35	Clay & Boulders	35 - 40	Gravel	
29	0 - 20	Gravel	20 - 60	Gravel & Clay	
			60 - 75	Clay & Boulders	
30	0 - 15	Brown Clay	15 - 60	Blue Clay & Boulders	
31	0 - 40	Boulders			
32	0 - 40	Clay & Boulders			
33	0 - 12	Brown Clay	12 - 60	Blue Clay & Boulders	
34	0 - 60	Clay & Boulders			
35	0 - 60	Clay Rocks & Boulders			
36	0 - 10	Sand	10 - 15	Gravel	
37	0 - 40	Sandy Clay & Gravel			
38	0 - 20	Clay & Boulders	20 - 30	Gravel	
			30 - 40	Clay & Boulders	
39	0 - 25	Clay	25 - 30	Cement Gravel	
	30 - 48	Clay	48 - 60	Sand	
40	0 - 40	Clay & Boulders			
41	0 - 5	Muskeg	5 - 40	Clay & Boulders	
42	0 - 5	Muskeg	5 - 40	Clay & Boulders	
43	0 - 60	Clay & Boulders			
44	0 - 4	Muskeg	4 - 44	Clay	
	44 - 50	Course Gravel & Rocks	50 - 60	Clay	
45	0 - 60	Clay, Rocks & Boulders			
46	0 - 12	Muskeg			
47	0 - 30	Clay	30 - 45	Boulders	
48	0 - 12	Muskeg			
49	0 - 15	Brown Clay	15 - 40	Blue Clay	
50	0 - 12	Brown Clay	12 - 40	Blue Clay	
51	0 - 45	Clay & Boulders			
52	0 - 40	Clay & Rocks			
53	0 - 45	Clay & Boulders			
54	0 - 45	Clay & Boulders			

AL

S.P. 55	0 - 30	Clay & Boulders	30 - 45	Gravel & Clay	
56	0 - 40	Clay & Boulders			
57	0 - 40	Sandy Clay & Gravel			
58	0 - 40	Sandy Clay & Gravel			
59	0 - 40	Clay & Boulders			
60	0 - 2	Muskeg	2 - 40	Clay & Rocks	
61	0 - 40	Clay & Boulders			
62	0 - 3	Muskeg	3 - 40	Clay & Rocks	
63	0 - 45	Clay & Boulders			
64	0 - 10	Brown Clay	10 - 40	Blue Clay & Boulders	
65	0 - 5	Muskeg	5 - 45	Clay & Rocks	
66	0 - 5	Muskeg	5 - 45	Clay & Rocks	
67	0 - 5	Muskeg	5 - 15	Brown Clay	
			15 - 40	Blue Clay	
68	0 - 5	Muskeg	5 - 45	Clay & Rocks	
69	0 - 40	Clay & Boulders			
70	0 - 12	Brown Clay & Boulders			
	12 - 40	Blue Clay & Boulders			
71	0 - 2	Muskeg	2 - 45	Clay & Rocks	
72	0 - 40	Clay & Gravel			
73	0 - 45	Clay Rocks & Gravel			
74	0 - 40	Clay & Boulders			
75	0 - 45	Clay & Boulders			
76	0 - 45	Clay & Boulders			
77	0 - 40	Clay, Rocks & Boulders			
78	0 - 45	Clay & Boulders			
79	0 - 40	Sandy Clay & Gravel			
80	0 - 40	Clay & Rocks			
81	0 - 40	Clay & Boulders			
82	0 - 40	Clay & Boulders			
83	0 - 45	Clay & Boulders			
84	0 - 5	Muskeg	5 - 40	Clay, Rocks & Boulders	
85	0 - 10	Muskeg	10 - 40	Clay & Boulders	
86	0 - 45	Clay & Boulders			
87	0 - 7	Muskeg	7 - 15	Brown Clay & Boulders	
			15 - 43	Blue Clay & Boulders	
88	0 - 5	Muskeg	5 - 40	Clay & Boulders	
89	0 - 3	Muskeg	3 - 12	Brown Clay & Boulders	
			12 - 40	Blue Clay & Boulders	
90	0 - 3	Muskeg	3 - 12	Clay & Boulders	
			12 - 40	Blue Clay & Boulders	
91	0 - 3	Muskeg	5 - 12	Brown Clay & Boulders	
			12 - 40	Blue Clay & Boulders	
92	0 - 5	Muskeg	5 - 12	Brown Clay & Boulders	
			12 - 43	Blue Clay & Boulders	
93	0 - 5	Muskeg	5 - 12	Brown Clay & Boulders	
			12 - 43	Blue Clay & Boulders	
94	0 - 5	Muskeg	5 - 12	Brown Clay & Boulders	
			12 - 43	Blue Clay & Boulders	
95	0 - 8	Muskeg	8 - 40	Clay, Boulders & Gravel	

AL

S.P. 96	0 - 20	Boulders			
97	0 - 3	Muskeg	3 - 18	Clay & Rocks	
	18 - 21	Gravel & Rocks	21- 40	Clay, Rocks & Boulders	
98	0 - 45	Clay Rocks & Gravel			
99	0 - 38	Sandy Clay & Gravel			
100	0 - 38	Sandy Clay & Gravel			
101	0 - 40	Sandy Clay & Gravel			
102	0 - 40	Sandy Clay & Gravel			
103	0 - 40	Clay & Boulders			
104	0 - 40	Clay & Boulders			
105	0 - 5	Muskeg	5 - 40	Clay & Boulders	
106	0 - 12	Brown Clay	12 - 20	Gravel	
			20 - 25	Blue Clay	
107	0 - 40	Sandy Clay & Boulders			
108	0 - 15	Very Hard Boulders	15 - 45	Clay & Very Hard Boulders	
109	0 - 15	Very Hard Boulders	15 - 45	Clay & Very Hard Boulders	
110	0 - 20	Sandy Clay	20 - 40	Clay & Boulders	
111	0 - 16	Gravel			
112	0 - 16	Gravel			
113	0 - 2	Muskeg	2 - 45	Clay & Rocks. Layers of Sand	
114	0 - 10	Brown Clay	10 - 43	Blue Clay & Boulders	
115	0 - 40	Clay & Boulders			
116	0 - 1	Muskeg	1 - 40	Clay & Boulders	
			40 - 45	Gravel	
117	0 - 10	Brown Clay	10 - 30	Blue Clay & Boulders	
			30 - 40	Gravel	
118	0 - 40	Clay & Boulders			
119	0 - 20	Clay & Boulders	20 - 24	Gravel	
120	0 - 40	Clay & Rocks			
121	0 - 40	Clay & Rocks			
122	0 - 40	Sandy Clay & Gravel			
123	0 - 10	Boulders	10 - 30	Gravel	
			30 - 40	Clay & Boulders	
124	0 - 10	Boulders	10 - 30	Gravel	
			30 - 40	Clay & Boulders	
125	0 - 40	Clay & Boulders			
126	0 - 40	Clay & Rocks			
127	0 - 40	Clay & Boulders			
128	0 - 40	Clay & Boulders			
129	0 - 40	Clay & Boulders			

AP

S.P. 1	0 - 45	Clay & Rocks
2	0 - 45	Clay & Very Hard Boulders
3	0 - 45	Clay & Boulders
4	0 - 45	Clay & Boulders
5	0 - 40	Clay & Boulders

AP

S.P. 6	0 - 35	Clay & Boulders			
7	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Boulders	
8	0 - 45	Clay & Boulders			
9	0 - 20	Muskeg	20 - 40	Clay & Boulders	
10	0 - 20	Muskeg	20 - 40	Clay & Boulders	
11	0 - 10	Muskeg	10 - 15	Brown Clay	
			15 - 43	Blue Clay & Boulders	
12	0 - 10	Muskeg	10 - 45	Clay & Rocks	
13	0 - 10	Muskeg	10 - 40	Clay & Boulders	
14	0 - 8	Muskeg	8 - 15	Brown Clay	
			15 - 43	Blue Clay	
15	0 - 5	Muskeg	5 - 45	Rocks	
16	0 - 8	Muskeg	8 - 40	Clay & Boulders	
17	0 - 40	Clay & Boulders			
18	0 - 45	Clay & Boulders			
19	0 - 45	Clay & Boulders			
20	0 - 40	Clay & Boulders			
21	0 - 20	Sand & Gravel			
22	0 - 2	Muskeg	2 - 40	Clay & Boulders	
23	0 - 20	Gravel	20 - 35	Boulders	
24	0 - 20	Gravel	20 - 40	Clay & Gravel	
25	0 - 3	Muskeg	3 - 40	Clay & Boulders	
26	0 - 3	Muskeg	3 - 40	Clay & Boulders	
27	0 - 15	Brown Clay	15 - 43	Blue Clay & Boulders	
28	0 - 45	Sandy Clay & Boulders			
29	0 - 2	Muskeg	2 - 45	Clay Rocks & Boulders	
30	0 - 40	Clay & Boulders			
31	0 - 4	Rock	4 - 9	Clay & Boulders	
			9 - 30	Blue Clay & Boulders	
32	0 - 18	Boulders	18 - 45	Clay & Rocks	
33	0 - 10	Boulders	10 - 20	Blue Clay & Boulders	
	20 - 30	Gravel & Boulders			
	32 - 43	Blue Clay & Boulders			
34	0 - 12	Brown Clay & Boulders			
	12 - 40	Blue Clay & Boulders			
35	0 - 20	Clay, Rocks & Hard Boulders			
	20 - 45	Gravel			
36	0 - 6	Muskeg	6 - 40	Clay & Rock	
37	0 - 40	Clay & Boulders			
38	0 - 40	Clay & Boulders			
39	0 - 8	Clay & Boulders	8- 25	Cemented Gravel	
			25- 45	Clay & Boulders	
40	0 - 40	Clay & Boulders			
41	0 - 40	Clay & Boulders			
42	0 - 40	Clay & Boulders			
43	0 - 20	Clay & Boulders			
44	0 - 40	Clay & Boulders			
45	0 - 40	Sandy Clay & Gravel			
46	0 - 40	Sandy Clay & Gravel			
47	0 - 8	Muskeg	8 - 40	Clay & Boulders	

AP

S.P. 48	0 - 10	Muskeg & Sand	10 - 30	Cemented Gravel	
			30 - 45	Clay & Boulders	
49	0 - 3	Muskeg	3 - 6	Gravel	
			6 - 40	Clay & Rock	
50	0 - 3	Muskeg	3 - 6	Gravel	
			6 - 40	Clay & Rock	
51	0 - 45	Clay & Boulders			
52	0 - 10	Brown Clay	10 - 13	Rock	
			13 - 43	Blue Clay	
53	0 - 40	Clay & Boulders			
54	0 - 40	Clay & Boulders			
55	0 - 45	Clay & Boulders			
56	0 - 40	Clay & Boulders			
57	0 - 12	Brown Clay	12 - 43	Blue Clay	
58	0 - 45	Clay & Boulders			
59	0 - 40	Clay & Boulders			
60	0 - 40	Clay & Boulders			
61	0 - 40	Clay & Boulders			
62	0 - 40	Clay & Boulders			
63	0 - 10	Gravel	10 - 43	Blue Clay & Boulders	
64	0 - 15	Sandy Clay & Gravel			
	15 - 45	Clay & Rocks			
65	0 - 40	Clay & Boulders			
66	0 - 40	Clay & Boulders			
67	0 - 10	Brown Clay	10 - 43	Blue Clay & Boulders	
68	0 - 40	Clay Gravel & Boulders			
69	0 - 40	Clay & Boulders			
70	0 - 45	Clay & Boulders			
71	0 - 20	Clay & Boulders			
72	0 - 2	Muskeg	2 - 40	Clay & Rock & Boulders 3 feet thick	
73	0 - 40	Sandy Clay & Boulders			
74	0 - 40	Sandy Clay & Gravel			
75	0 - 40	Sandy Clay & Gravel			
76	0 - 40	Sand & Gravel			
77	0 - 40	Sand & Gravel			
78	0 - 40	Clay & Rock			
79	0 - 10	Sand	10 - 25	Clay & Boulders	
			25 - 45	Layers of Limestone & Clay	
80	0 - 24	Muskeg	24 - 29	Boulders	
			29 - 40	Clay & Rocks	
81	0 - 40	Clay Gravel & Boulders			
82	0 - 40	Clay & Boulders			
83	0 - 40	Clay Gravel & Boulders			
84	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Boulders	
85	0 - 40	Clay & Boulders			
86	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Boulders	
87	0 - 45	Clay & Boulders			
88	0 - 5	Muskeg	5 - 40	Clay & Boulders	
89	0 - 40	Gravel Clay & Boulders			
90	0 - 40	Clay & Boulders			

AP

S.P. 91	0 - 40	Clay & Boulders			
92	0 - 45	Clay & Boulders			
93	0 - 5	Muskeg	5 - 40	Clay & Boulders	
94	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Boulders	
95	0 - 2	Muskeg	2 - 20	Clay & Rocks	
	20 - 30	Gravel	30 - 45	Clay & Rocks	
96	0 - 7	Muskeg	7 - 40	Clay & Boulders & Streaks of Gravel	
97	0 - 10	Brown Clay & Boulders	10 - 43	Blue Clay & Boulders	
98	0 - 40	Gravel Clay & Boulders			
99	0 - 2	Muskeg	2 - 45	Clay & Layers of Gravel	
100	0 - 15	Gravel	15 - 40	Sand & Gravel	
101	0 - 40	Clay & Boulders			
102	0 - 40	Clay & Boulders			
103	0 - 40	Clay & Boulders			
104	0 - 15	Sand & Muskeg			
105	0 - 40	Clay & Boulders			
106	0 - 40	Clay & Boulders			
107	0 - 10	Muskeg	10 - 30	Sand & Pea Gravel	
108	0 - 15	Clay & Boulders	15 - 45	Sandy Clay	
109	0 - 40	Clay & Boulders			
110	0 - 12	Clay	12 - 40	Gravel	
111	0 - 6	Muskeg	6 - 15	Gravel	
			15 - 40	Clay Rocks & Gravel	
112	0 - 40	Clay & Boulders			
113	0 - 4	Muskeg	4 - 45	Sand, Water & Gravel	
114	0 - 4	Muskeg	4 - 45	Sand, Water & Gravel	
115	0 - 40	Clay Gravel & Boulders			
116	0 - 10	Brown Clay & Boulders	10 - 43	Blue Clay & Boulders	
117	0 - 40	Clay & Boulders			
118	0 - 3	Muskeg	3 - 12	Brown Clay & Boulders	
			12 - 43	Blue Clay & Boulders	
119	0 - 40	Clay & Boulders			
120	0 - 40	Clay & Boulders			
121	0 - 5	Muskeg	5 - 40	Clay & Boulders	
122	0 - 10	Brown Clay	10 - 43	Blue Clay & Rock	
123	0 - 15	Rocks & Gravel	15 - 40	Clay & Boulders	
124	0 - 7	Muskeg	7 - 40	Clay & Boulders	
125	0 - 5	Muskeg	5 - 40	Clay & Boulders	
126	0 - 40	Clay & Boulders			
127	0 - 40	Clay & Boulders			
128	0 - 2	Muskeg	2 - 45	Clay & Rocks	
129	0 - 2	Muskeg	2 - 45	Clay & Rocks	

AJ

S.P. 1	0 - 40	Clay Gravel & Boulders			
2	0 - 30	Clay & Gravel	30 - 45	Clay & Boulders	
3	0 - 40	Clay & Rock			
4	0 - 40	Clay & Rock			
5	0 - 15	Gravel	15 - 40	Sandy Clay & Gravel	
6	0 - 20	Sand & Gravel	20 - 40	Sandy Clay & Gravel	

AJ

S.P. 7	0 - 10	Gravel	10 - 40 Sandy Clay & Boulders
8	0 - 40	Clay & Rocks	
9	0 - 40	Clay Gravel & Boulders	
10	0 - 40	Clay & Boulders	
11	0 - 40	Clay & Boulders	
12	0 - 40	Clay & Boulders	
13	0 - 40	Clay & Boulders	
14	0 - 40	Clay & Boulders	
15	0 - 40	Clay Gravel & Boulders	
16	0 - 10	Brown Clay & Boulders	10 - 40 Blue Clay & Boulders
17	0 - 45	Clay & Rocks	
18	0 - 40	Sand & Rocks	
19	0 - 45	Clay & Rocks & Layers of Gravel	
20	0 - 15	Brown Clay	15 - 20 Hard Rock
	20 - 30	Gravel	30 - 43 Blue Clay & Boulders
21	0 - 40	Clay & Rock	
22	0 - 40	Gravel & Boulders	
23	0 - 40	Clay Boulders & Streaks of Gravel	
24	0 - 45	Clay & Boulders & Layers of Gravel	
25	0 - 12	Brown Clay	12 - 17 Rock
			17 - 43 Blue Clay & Boulders
26	0 - 40	Clay & Boulders	
27	0 - 40	Clay & Boulders & Sand at 15'	
28			
29	0 - 20	Gravel	25 - 40 Boulders
30	0 - 45	Clay & Boulders	
31	0 - 40	Clay & Rocks	
32	0 - 40	Sandy Clay & Boulders	
33	0 - 40	Sandy Clay & Gravel	
34	0 - 45	Clay & Boulders	
35	0 - 25	Gravel	25 - 40 Sandy Clay & Boulders
36	0 - 40	Clay, Gravel & Boulders	
37	0 - 5	Muskeg	5 - 10 Pea Gravel
			10 - 45 Clay & Boulders
38	0 - 40	Sandy Clay & Boulders	
39	0 - 40	Clay, Gravel & Boulders	
40	0 - 45	Clay, Rocks & Layers of Gravel	
41	0 - 25	Clay & Boulders	25 - 35 Gravel
42	0 - 40	Boulders & Clay	
43	0 - 4	Muskeg	4 - 33 Clay & Rock
			33 - 37 Gravel 37 - 40 Clay
44	0 - 12	Brown Clay	12 - 43 Blue Clay & Boulders
45	0 - 45	Clay, Boulders & Layers of Gravel	
46	0 - 12	Brown Clay	12 - 43 Gravel, Layers of Clay & Boulders
47	0 - 40	Rocks & Clay	
48	0 - 10	Skid	10 - 20
			20 - 43 Gravel & Boulders
49	0 - 40	Clay & Boulders	
50	0 - 40	Sandy Clay, Boulders & Gravel	

AJ

S.P. 51	0 - 40	Sandy Clay, Boulders & Gravel			
52	0 - 30	Clay & Rocks	30 - 40	Gravel	
53	0 - 10	Muskeg	10 - 40	Clay & Boulders	
54	0 - 10	Muskeg	10 - 40	Clay, Boulders & Gravel	
55	0 - 4	Muskeg	4 - 30	Clay & Rocks	
			30 - 45	Sand & Gravel	
56	0 - 12	Brown Clay	12 - 30	Blue Clay & Boulders	
			30 - 43	Sand & Gravel	
57	0 - 1	Ice	1 - 45	Clay & Rock	
58	0 - 40	Sand & Boulders			
59	0 - 15	Muskeg	15 - 40	Sandy Clay & Gravel	
60	0 - 40	Clay & Boulders			
61	0 - 15	Muskeg	15 - 40	Sandy Clay & Gravel	
62	0 - 10	Muskeg	10 - 40	Clay & Boulders	
63	0 - 10	Muskeg	10 - 20	Sand, Pea Gravel	
			20 - 45	Clay & Boulders	
64	0 - 12	Muskeg	12 - 40	Clay, Rock and Boulders	
65	0 - 15	Muskeg	15 - 30	Clay & Boulders	
			30 - 45	Sand & Hard Layers	
66	0 - 15	Muskeg	15 - 40	Clay, Gravel & Boulders	
67	0 - 15	Muskeg	15 - 40	Clay & Boulders	
68	0 - 10	Muskeg	10 - 40	Sandy Clay & Gravel	
69	0 - 40	Muskeg Clay Gravel Boulders & Sand			
70	0 - 40	Muskeg Clay Gravel Boulders & Sand			
71	0 - 3	Muskeg	3 - 40	Clay & Rocks	
72	0 - 40	Clay & Boulders			
73	0 - 10	Brown Clay & Boulders	0 - 43	Blue Clay & Boulders	
74	0 - 45	Clay & Rocks			
75	0 - 40	Clay & Boulders			
76	0 - 10	Brown Clay	10 - 43	Blue Clay & Boulders	
77	0 - 10	Brown Clay	10 - 43	Blue Clay & Boulders	
78	0 - 45	Clay Rocks & Boulders			
79	0 - 45	Clay Rocks & Boulders			
80	0 - 12	Brown Clay	12 - 20	Blue Clay & Boulders	
			20 - 43	Sand & Layers of Rock	
81	0 - 12	Brown Clay	12 - 20	Blue Clay & Boulders	
			20 - 43	Sand & Layers of Rock	
82	0 - 12	Brown Clay	12 - 20	Blue Clay & Boulders	
			20 - 43	Sand & Layers of Rock	
83	0 - 40	Clay & Boulders			
84	0 - 40	Clay & Boulders			
85	0 - 45	Clay & Rocks			
86	0 - 45	Clay & Rocks			
87	0 - 40	Clay & Boulders			
88	0 - 45	Clay & Rocks			
89	0 - 40	Clay, Gravel, Boulders & Sand			
90	0 - 20	Sand & Gravel	20 - 40	Sand & Gravel	
91	0 - 12	Muskeg	12 - 40	Sand & Gravel	
92	0 - 10	Muskeg	10 - 30	Gravel	30 - 45 Sand
93	0 - 3	Muskeg	3 - 40	Clay	
94	0 - 3	Muskeg	3 - 40	Clay	
95	0 - 40	Sand			
96	0 - 10	Brown Clay & Boulders	10 - 43	Blue Clay & Boulders	
97	0 - 10	Muskeg	10 - 35	Clay & Boulders	
			35 - 45	Sand	

AJ

S.P. 98	0 - 40	Clay & Rocks			
99	0 - 5	Muskeg	5 - 40	Sandy Clay & Boulders	
100	0 - 45	Clay & Rocks			
101	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Boulders	
102	0 - 45	Clay & Boulders			
103	0 - 40	Clay & Rocks			
104	0 - 45	Clay & Boulders			
105	0 - 10	Brown Clay & Boulders	10 - 43	Blue Clay & Layers of Rock	
106	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Layers of Rock	
107	0 - 40	Quick Sand			
108	0 - 10	Muskeg	10 - 40	Clay & Boulders	
109	0 - 6	Muskeg	6 - 40	Sandy Clay & Boulders	
110	0 - 40	Clay & Rocks			
111	0 - 45	Clay & Boulders			
112	0 - 5	Muskeg	5 - 40	Clay & Boulders	
113	0 - 8	Muskeg	8 - 40	Sand Clay & Boulders	
114	0 - 5	Muskeg	5 - 40	Clay & Boulders	
115	0 - 40	Clay, Gravel & Boulders			
116	0 - 3	Muskeg	3 - 12	Gravel	
	12 - 20	Clay & Rocks	20 - 40	Gravel & Boulders	
117	0 - 10	Gravel	10 - 40	Clay & Boulders	
118	0 - 10	Gravel	10 - 40	Clay & Boulders	
119	0 - 12	Clay & Gravel	12 - 40	Clay Rocks & Boulders	
120	0 - 20	Clay, Boulders, Sand & Gravel			
121	0 - 40	Clay & Boulders			
122	0 - 45	Clay Rocks & Layers of Gravel			
123	0 - 12	Brown Clay & Boulders			
	12 - 43	Blue Clay & Layers of Gravel			
124	0 - 5	Muskeg	5 - 45	Sand & Gravel	
125	0 - 10	Gravel (Blind)	10 - 40	Clay & Boulders	
126	0 - 5	Gravel	5 - 40	Sandy Clay & Boulders	
127	0 - 30	Sandy Clay & Boulders	30 - 40	Sand & Gravel	
128	0 - 45	Clay, Boulders, Layers of Gravel			
129					
130	0 - 40	Clay & Boulders			
131	0 - 12	Brown Clay	12 - 22	Gravel	
	22 - 43	Blue Clay & Layers of Rock			
132	0 - 40	Gravel & Rocks			
133	0 - 12	Brown Clay, Layers of Gravel			
	12 - 20	Blue Clay, Boulders			
134	0 - 13	Brown Clay & Boulders			
	13 - 43	Blue Clay, Layers of Gravel			
135	0 - 2	Muskeg	2 - 45	Clay & Boulders	
136	0 - 10	Muskeg	10 - 30	Sandy Clay & Boulders	
			30 - 40	Gravel	
137	0 - 12	Brown Clay & Boulders			
	12 - 43	Blue Clay & Layers of Rock			
138	0 - 12	Brown Clay & Boulders			
	12 - 43	Blue Clay & Layers of Gravel			
139	0 - 10	Muskeg	10 - 30	Sandy Clay & Boulders	
			30 - 40	Gravel	

AJ

S.P. 140	0 - 4	Muskeg	4 - 40	Clay, Rock & Boulders	
141	0 - 45	Clay, Boulders & Layers of Gravel			
142	0 - 10	Brown Clay & Layers of Gravel			
	10 - 20	Blue Clay & Boulders	20 - 30	Gravel	
	30 - 43	Blue Clay			
143	0 - 12	Brown Clay & Layers of Gravel			
	12 - 43	Blue Clay & Boulders			
144	0 - 4	Muskeg	4 - 40	Clay, Rock & Boulders	
145	0 - 6	Muskeg	6 - 40	Clay & Rocks	
146	0 - 40	Clay, Gravel, Sand & Boulders			
147	0 - 40	Clay & Boulders			
148	0 - 40	Clay & Boulders			
149	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Layers of Gravel	
150	0 - 45	Clay, Rocks & Layers of Gravel			
151	0 - 40	Clay & Boulders			
152	0 - 45	Clay, Rocks & Layers of Gravel			
153	0 - 45	Clay, Rocks & Layers of Gravel			
154	0 - 5	Muskeg	5 - 40	Clay & Boulders	
155	0 - 5	Muskeg	5 - 40	Clay & a Ledge of Rock	
156	0 - 40	Clay & Boulders			
157	0 - 12	Brown Clay & Boulders	12 - 20	Rock & Clay	
			20 - 30	Gravel	
158	0 - 40	Clay & Boulders			
159	0 - 40	Clay & Boulders			
160	0 - 40	Clay & Boulders			
161	0 - 5	Muskeg	5 - 43	Blue Clay & Layers of Gravel	
162	0 - 45	Clay & Boulders			
163	0 - 45	Clay & Boulders			

AK

129	0 - 35	Sandy Clay & Boulders	35 - 40	Gravel	
130	0 - 45	Clay & Boulders			
131	0 - 40	Clay & Boulders			
132	0 - 40	Clay & Boulders			
133	0 - 5	Muskeg	5 - 40	Clay & Boulders	
134	0 - 5	Muskeg	5 - 20	Sandy Clay & Boulders	
			20 - 25	Gravel	
135	0 - 5	Clay	5 - 45	Sand & Gravel	
136	0 - 40	Clay & Boulders			
137	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Layers of Rock	
138	0 - 12	Brown Clay & Boulders	12 - 43	Blue Clay & Layers of Gravel	
139	0 - 5	Muskeg	5 - 40	Clay & Boulders	
140	0 - 30	Clay & Boulders	30 - 40	Gravel	
141	0 - 45	Clay, Boulders & Layers of Gravel			
142	0 - 10	Brown Clay & Layers of Gravel			
	10 - 20	Blue Clay & Boulders	20 - 30	Gravel	
	30 - 43	Blue Clay			

AK

S.P. 143	0 - 12	Brown Clay & Layers of Gravel	
	12 - 43	Blue Clay & Boulders	
144	0 - 35	Clay & Boulders	35 - 40 Gravel
145	0 - 40	Clay & Boulders	
146	0 - 45	Clay, Rocks & Layers of Gravel	
147	0 - 40	Clay, Gravel, Boulders	
148	0 - 40	Clay, Gravel & Boulders	
149	0 - 5	Muskeg	5 - 40 Clay & Boulders
150	0 - 15	Gravel	15 - 40 Clay & Boulders
151	0 - 20	Clay & Boulders	20 - 40 Gravel
152	0 - 45	Clay, Rocks & Layers of Gravel	
153	0 - 40	Clay, Boulders & Gravel	
154	0 - 40	Gravel & Boulders	

SEISMIC SURVEY

TROUT LAKE AREA, N.W.T.

UNION OIL COMPANY OF CANADA LTD.

TROUT LAKE AREA

Northwest Territories

hu 95-186

Submitted to

UNION OIL COMPANY OF CANADA, LIMITED

By

NATIONAL GEOPHYSICAL COMPANY OF CANADA, LIMITED

SUMMARY AND CONCLUSIONS

The seismic survey in the Trout Lake Area was intended as added detail and confirmation of existing seismic control. As such, the survey will furnish a substantial amount of usable data.

Several interesting leads of structural anomalies are uncovered. Further investigation is definitely indicated which, if not resolved by the integration of all the available seismic data, should be augmented with additional seismic surveys.

Except in the southern part of the area, record quality is poor. Any further seismic work should be accompanied by a serious attempt to improve record quality. Even a slight improvement in the field data would considerably raise the quality of the final interpretation.

INTRODUCTION

The Trout Lake Prospect lies within the Northwest Territories approximately 140 miles north and east of Fort Nelson, B.C. The area is accessible by road and bulldozed trails from Fort Nelson.

Seismic personnel were housed in a field camp which was supplied by road and air from Fort Nelson. Communication to the outside was maintained by radio telephone.

The terrain is quite flat with very little drainage. Vegetation consists primarily of scrub evergreens. Small lakes and muskegs are numberous throughout the area.

The seismic program consisted of 5 lines for a total of approximately 46 miles covering an area of approximately 270 square miles.

GEOLOGY

The Trout Lake prospect is located geologically over the Pathlina Uplift on the east flank of the Northern Alberta Basin.

In Middle Devonian time during Upper Elk Point sedimentation the Presqu'ile reef complex was developed on the Keg River carbonate in the area. The reef is typically 600 to 700 feet thick. As yet no production from the reef in the immediate area has been established.

The overlying Middle Devonian Slave Point formation has produced substantial quantities of gas in Northeastern British Columbia and the Northwest Territories. Most of the production is found in barrier reef edges along the facies front between the carbonate shelf and the shale basin.

ENCLOSURES

Included with the report are copies of the following seismic maps.

1. Devonian Structure
2. Utahn Structure
3. Slave Point Structure
4. Utahn to Slave Point Isochron

PROCEDURES

OBJECTIVE:

The object of the survey was to provide additional seismic control in the areas of interest established in previous surveys.

REFLECTIONS MAPPED:

Seismic events believed to correspond to the Devonian. Utahn and Slave Point formations were mapped. Identification of the events was made by correlation to records from previous surveys which had been continuously correlated and tied to available well control.

COMPUTING PROCEDURE:

The seismic records were computed to a 1500 feet datum plane supplied by the Client. The computation procedure involves the plotting of refraction "breaks" at each shot point and the computing of each trace of each record to compensate for weathering, drift and correction to

datum with one single computation. All correctional velocities were taken from the refraction plots.

RECORD SECTIONING PROCEDURE:

Individual corrections were applied to each trace on every record which effectively corrected for elevation, weathering and drift variations. The six traces from different shot points and receiving stations corresponding to the same sub-surface point were then "stacked" to give one single trace on the final record section. Each trace then represents the summation of the reflection at one sub-surface point as recorded from six different surface locations.

DISCUSSION OF RESULTS

Record quality in the Trout Lake Area ranges from good to poor with the majority of records in the fair to poor range. The AA line, the most southerly line is of good quality. The remainder of the lines are fair to poor in quality.

Seismic events corresponding to the Devonian, Utahn and Slave Point formations were mapped. All three reflectors are of equal quality and intensity. Where general record quality is good, reflections from these markers are distinctive and easily correlatable. Their reliability is directly proportional to the overall record quality.

Structure at both Devonian and Utahn levels is similar, exhibiting a uniform, almost due south dip.

The Slave Point structure, in contrast, shows dip generally to the southwest. Much more local relief is present. Anomalous structural features are shown in two separate localities in the area.

A definite high at the extreme southwest end of line AA shows at least .040 seconds of northwest dip into a saddle separating the feature from the remainder of the area. Coupled with this dip reversal is the appearance of the record section showing the east flank of the structure. Although the quality of section along the whole of the line is good, the Slave Point reflection is highly disturbed from S.P. 54A to 51A. Reflections within .100 seconds of the major event appear smooth and consistant. The conclusion that an irregular reef mass lies in this zone is almost unavoidable.

To the northwest, line AG is isolated from the remainder of the program. Correlation of the seismic section across the gap appears fairly reliable. There is apparently a considerable flattening or reversal of dip between lines AB and AG. Without control, further postulation is not possible.

The effect of this change in dip is shown on the Utahn to Slave Point isochron map as an extensive thin, covering the complete area between the two lines.

To the southwest, structure on the Slave Point is reflected on the isochron map by the major thickening of the Utahn-Slave Point interval from the southwest end of line AA, almost to the centre of the line. Some .070 seconds of thickening occurs within this six miles.

RECOMMENDATIONS

Two significant seismic anomalies have been uncovered. To the south west of the area, additional control using the present technique, should result in definite isolation and analysis of the anomaly.

To the northwest, in addition to more control, some improvement in field record quality is necessary.

The area south and east of the Briggs Trout Lake well appears of more interest than the actual well location. If the existing control here is not conclusive, more detail should certainly be added.

Respectfully submitted,

NATIONAL GEOPHYSICAL COMPANY
OF CANADA LIMITED

A.P. Seifert - Party Chief

C.L. Hart - Supervisor

STATISTICAL REPORT

1. Commencement Date of Work: February 21, 1966

2. Date of Completion: March 31, 1966

3. a. Field recording time: 237.8 hours

   b. Moving and holiday time 131.2 hours

   c. Total crew hours a. and b.: 369.0 hours

4. a. Number of locations recorded as split profiles: 543

   b. Number of locations recorded as weathering profiels: -

   c. Number of locations recorded as single-end profiles other than weathering profiles: -

5. a. Number of shots taken: 565

   b. Average number of shots per locations: 1.04

   c. Total dynamite used: 4084.75 lbs.

   d. Average dynamite per shot: 7.2 lbs.

*6. Number of Locations Recorded per Ten Hour Day: 22.8

7. Total miles of Subsurface coverage obtained: 46.46 mi.

8. Miles of Subsurface coverage per Ten hour day: 1.95 mi.

9. Drill #D-285 1st Tour

   (a) Field time: 200.8 hrs.

   (b) Moving & holiday time: 159.0 hrs.

   (c) Total time (a) & (b): 359.8 hrs.

   (d) Total footage: 5,790 ft.

   (e) Footage per ten hour day: 288.3 ft.

STATISTICAL REPORT (Continued)

Drill #D-285 2nd Tour	(a) Field time:	196.0 hrs.
	(b) Moving & holiday time:	79.0 hrs.
	(c) Total time (a) & (b):	275.0 hrs.
	(d) Total footage:	4,010 ft.
	(e) Footage per ten hour day:	204.6 ft.
Drill #D-6 (Gyro) 1st Tour	(a) Field time:	269.2 hrs.
	(b) Moving and holiday time:	143.3 hrs.
	(c) Total time (a) & (b):	412.5 hrs.
	(d) Total footage:	13,050 ft.
	(e) Footage per 10 hour day:	484.4 ft.
Drill #D-6 (Gyro) 2nd Tour	(a) Field time:	238.5 hrs.
	(b) Moving and holiday time:	113.5 hrs.
	(c) Total time (a) and (b):	352.0 hrs.
	(d) Total footage:	14,770 ft.
	(e) Footage per 10 hour day:	619.3 ft.
Drill #D-3 (Gyro) 1st Tour	(a) Field time:	265.7 hrs.
	(b) Moving and holiday time:	138.3 hrs.
	(c) Total time (a) & (b)"	404.0 hrs.
	(d) Total footage:	12,640 ft.
	(e) Footage per 10 hour day:	472.0 ft.

STATISTICAL REPORT (continued)

Drill #D-3 (Gyro) 2nd Tour

(a) Field time: 239.5 hrs.

(b) Moving and holiday time: 113.5 hrs.

(c) Total time (a) and (b): 353.0 hrs.

(d) Total footage: 13,255 ft.

(e) Footage per 10 hour day: 553.4 ft.

10. Dozing:

Dozer # RM-5 1st Tour

(a) Hours cutting 242.0 Miles 53.0

(b) Hours cleaning - Miles -

(c) Total hours 242.0 Total Miles 53.0

Dozer # RM-5 2nd Tour

(a) Hours cutting - Miles -

(b) Hours cleaning 242.0 Miles 53.0

(c) Total Hours 242.0 Total Miles 53.0

Dozer # RM-3 1st Tour

(a) Hours cutting 66.0 Miles 12.0

(b) Hours cleaning - Miles -

(c) Total hours 66.0 Total miles 12.0

Dozer # RM-3 2nd Tour

(a) Hours cutting - Miles -

(b) Hours cleaning 66.0 Miles 12.0

(c) Total hours 66.0 Total Miles 12.0

11. (a) Maximum surface elevation: 1910.3 @ AB-49F

Minimum surface elevation: 1255.9 @ AG-30A

* Definition of location: A shot is credited as a location whenever new subsurface coverage is obtained and/or whenever the movement of one or more cables is involved.

FIELD EQUIPMENT AND TECHNIQUE

1. Type of instruments and Tape used:

   Amplifiers - National Geophysical Company 26A

   Techno Tape

2. Geophone Type: Geo Space - Hall-Sears 14 cycle

3. Location to Location Distance: 440'

4. Offset to First Group: 110'

5. Group Interval: 220'

6. Number of Geophones per Group: 9

7. Geophone-In-Group- Arrangement: In Line 17' interval between geophones

8. Number of Holes per Location: 3 hole patterns

9. Hole Spacing: 75' between holes

10. Average Hole Depth: 40'

11. Recording Procedure: (Recording tape-filter, A.G.C., etc.)
    (Playback-filter, A.G.C., etc.)

    Monitor - BHHH Filter (19-125) AGC-48 Straight (I)

    Playback - CHEH Filter (26-76) AGC-36 Straight (I)

SEISMIC SURVEY

ISLAND RIVER)
TRAINOR LAKE) N.W.T.

UNION OIL COMPANY OF CANADA LIMITED

(16)

ISLAND RIVER AREA

Northwest Territories

Submitted to

UNION OIL COMPANY OF CANADA, LIMITED

By

NATIONAL GEOPHYSICAL COMPANY OF CANADA, LIMITED

SUMMARY AND CONCLUSIONS

The seismic survey in the Island River Area is considered to be successful. Although the amount and location of the lines shot precludes mapping in detail, the individual record sections indicate substantial structural anomalies. If the existing seismic control is of similar quality there should be little difficulty in evaluating the prospect.

The present field technique appears to be adequate to assure reasonably reliable information in future seismic surveys.

INTRODUCTION

The Island River prospect lies within the Northwest Territories approximately 130 miles northeast of Fort Nelson, B.C. The area is accessible by raod and bulldozed trails from Fort Nelson.

The seismic camp was supplied by road and by air from Fort Nelson. Communication to the outside was maintained by radio telephone.

The terrain is generally flat, lightly forested and cut by many small creeks and streams. Numerous small lakes and muskegs dot the area.

The seismic program consisted of two separate surveys approximately eight miles apart. Each survey was comprised of three lines; the southern segment containing approximately 15 miles and that to the north approximately 21 miles.

GEOLOGY

The Island River prospect os located geologically over the Tathlina Uplift on the east flank of the Northern Alberta Basin.

In Middle Devonian time during upper Elk Point sedimentation the Presqu'ile reef complex was developed on the Keg River carbonate in the area. The reef is typically 600 to 700 feet thick. As yet no production from the reef in the immediate area has been established.

The overlying Middle Devonian Slave Point formation has produced substantial quantities of gas in northeastern British Columbia and the Northwest Territories. Most of the production is found in barrier reef ridges along the facies front between the carbonate shelf and the shale basin.

ENCLOSURES

Included with the report are prints of the following seismic maps.

1. Mississippian Structure
2. Devonian Structure
3. Utahn Structure
4. Slave Point Structure
5. Utahn to Slave Point Isochron

PROCEDURES

OBJECTIVE:

The object of the survey was to provide addtional seismic control in areas of interest noted from previous surveys.

REFLECTIONS MAPPED:

Seismic events believed to correspond to the Mississippian, Devonian, Utahn and Slave Point formations were mapped. Identification of the events was taken from times established from previous surveys which had been carried throughout the area and tied to available well control.

COMPUTING PROCEDURE:

The seismic records were computed to a "floating" datum plane supplied by the client. The computation procedure involved the plotting of the refraction "breaks" at each shot point and the computing of each trace of each record to compensate for weathering, drift and correction to datum with one single computation. All correctional velocities were taken from the refraction plots.

RECORD SECTIONING PROCEDURE:

Individual corrections were applied to each trace on every record which effectively corrected for elevation, weathering and drift variations. The six traces from different shot points and receiving stations corresponding to the same sub-surface point were then "stacked" to give one

single trace on the final record section. Each trace then represents the summation of the reflection at one sub-surface point as recorded from six different locations.

DISCUSSION OF RESULTS

Record quality in the Island River area ranges from good to poor with the majority of records in the good to fair range.

Seismic events corresponding to the Mississippian, Devonian, Utahn and Slave Point formations were mapped. All four reflectors are of equal quality and intensity. Where general record quality is good, reflections from these markers are distinctive and easily correlatable. Their reliability is directly proportional to the overall record quality.

The main Mississippian structural feature in the south Island River prospect is the high nose extending into the area from the east. Dip to the east from the high is slight and might be questioned. The Mississippian in the north Island River prospect features a northwest-southeast high through the middle of the area. Dip to the southeast and northeast from the ridge is fairly well established.

The Devonian structure conforms quite closely to that at Mississippian level. In the south Island River area, the dip is primarily due west

with some indication of the high nose projecting into the area from the southeast. In the north Island River area, the northwest-southeast ridge noted on the Mississippian is even more prominent. More than .020 seconds of northeast dip is quite well established.

The Utahn structure in the Island River area shows an almost due west dip. The same indication of the nose shown higher in the section is present, but is less pronounced. In the north Island River area the Utahn structure conforms to the overlying formations showing the northwest-southeast ridge.

The Slave Point structure is by far the most interesting with much more relief than any of the higher formations. Particularly noticeable is the abrupt change in dip which occurs in both north and south prospects. on the west part of the surveyed areas. In each case poor relfections on this horizon interupt the continuous correlation but is believed that the correlation across these poorer zones is essentially correct.

It would appear that the prospects straddle the hinge line separating the Slave Point shale basin to the west and the carbonate bank to the east.

In the south Island River prospect there is no definite indication of east dip or closure. North Island River however does show .020 seconds of closure.

The Utahn to Slave Point isochron shows thinning between the two horizons corresponding to the highs on the Slave Point structure map.

Both north and south prospects appear to contain structural anomalies which certainly bear additional investigation.

RECOMMENDATION

The present survey clearly indicates the sharp west flank of the Slave Point reef or carbonate bank in both the north and south Island River prospects.

More control however is necessary to the east to investigate the possibility of east dip and possible structural closure.

The north Island River structure shows east dip to the end of the present survey in the northeast. If additional closure is present to the southeast this structure could be particularly interesting.

The "roll-a-long" seismic technique used in the present survey is producing good data of reliable interpretation.

Respectfully submitted,

NATIONAL GEOPHYSICAL COMPANY
OF CANADA LIMITED

A.P. Seifert - Party Chief

C.L. Hart - Supervisor

STATISTICAL REPORT

1. Commencement Date of Work: January 13, 1966

2. Date of Completion: February 21, 1966

3. a, Field recording time: 2333.3 hrs.

   b. Moving and holiday time: 66.6 hrs.

   c. Total crew hours a. and b. 299.9 hrs.

4. a. Number of locations recorded as split profiles: 436

   b. Number of locations recorded as weathering profiles: _____

   c. Number of locations recorded as single-end profiles other than weathering profiles: _____

5. a. Number of shots taken: 460

   b. Average number of shots per locations: 1.06

   c. Total dynamite used: 2,868.0 lbs.

   d. Average dynamite per shot: 6.2 lbs.

*6. Number of Locations Recorded per Ten Hour day: 18.3

7. Total miles of Subsurface coverage obtained: 36.33 mi.

8. Miles of Subsurface Coverage per Ten Hour day: 1.56 mi.

9. Drill # 285
   1st Tour

   (a) Field time: 109.3 hrs.

   (b) Moving & holiday time: 69.4 hrs.

   (c) Total time (a) & (b): 178.7 hrs.

   (d) Total footage: 2,110 ft.

   (e) Footage per ten hour day: 190.3 ft.

STATISTICAL REPORT (continued)

Drill # 285 2nd Tour	(a) Field time:	72.5 hrs.
	(b) Moving & holiday time:	14.1 hrs.
	(c) Total time (a) & (b):	86.6 hrs.
	(d) Total footage	1,385 ft.
	(e) Footage per ten hour day:	191.0 ft.
10. Drill # D-6 Gyro 1st Tour	(a) Field time:	303.2 hrs.
	(b) Moving and holiday time:	115.8 hrs.
	(c) Total time (a) & (b)	419.0 hrs.
	(d) Total footage:	17,135 ft.
	(e) Footage per 10 hour day:	565.1 ft.
Drill # D-6 (Gyro	(a) Field time:	314.3 hrs.
	(b) Moving and holiday time:	67.7 hrs.
	(c) Total time (a) & (b):	382.0 hrs.
	(d) Total footage:	14,565 ft.
	(e) Footage per 10 hour day:	463.4 ft.
Drill # D-3 Gyro 1st Tour	(a) Field time:	262.9 hrs.
	(b) Moving and holiday time:	104.6 hrs.
	(c) Total time (a) & (b):	367.5 hrs.
	(d) Total footage:	14,970 ft.
	(e) Footage per 10 hour day:	476.3 ft.

Drill # D-3 Gyro 2nd Tour

(a) Field time: 273.5 hrs.

(b) Moving and Holiday time: 61.0 hrs.

(c) Total time (a) & (b): 334.5 hrs.

(d) Total footage: 12,066 ft.

(e) Footage per 10 hour day: 441.2 ft.

10. Dozing:

(a) Hours cutting _____ Miles _____

Dozer # _____ (b) Hours cleaning _____ Miles _____

(c) Total hours _____ Total Miles _____

Dozer # _____ (a) Hours cutting _____ Miles _____

(b) Hours cleaning _____ Miles _____

(c) Total hours _____ Total miles _____

Dozer # _____ (a) Hours cutting _____ Miles _____

(b) Hours cleaning _____ Miles _____

(c) Total hours _____ Total miles _____

Dozer # _____ (a) Hours cutting _____ Miles _____

(b) Hours cleaning _____ Miles _____

(c) Total hours _____ Total Miles _____

* Definition of "location": A shot is credited as a location whenever new subsurface coverage is obtained and/or whenever the movement of one or more cables is involved.

11. (a) Maximum surface elevation: 2594.3 @ BD-35F
Above sea level
Minimum surface elevation: 1806.4 @ BC-37F

FIELD EQUIPMENT AND TECHNIQUE

1. Type of instruments and Tape used:

   Amplifiers - National Geophysical Company 26A

   Techno Tape

2. Geophone Type: Geo Space - Hall-Sears 14 cycle

3. Location to Location Distance: 440'

4. Offset to First Group: 110'

5. Group Interval: 220'

6. Number of Geophones per group: 9

7. Geophone-in-group Arrangement: In Line 17' interval between geophones

8. Number of holes per location: 3 hole patterns

9. Hole spacing: 75' between holes

10. Average hole depth: 40'

11. Recording Procedure: (Recording tape-filter, A.G.C., etc.)
    (Playback filter, A.G.C., etc.)

    Monitor - BHHH filter (19-125) AGC-48 Straight (I)

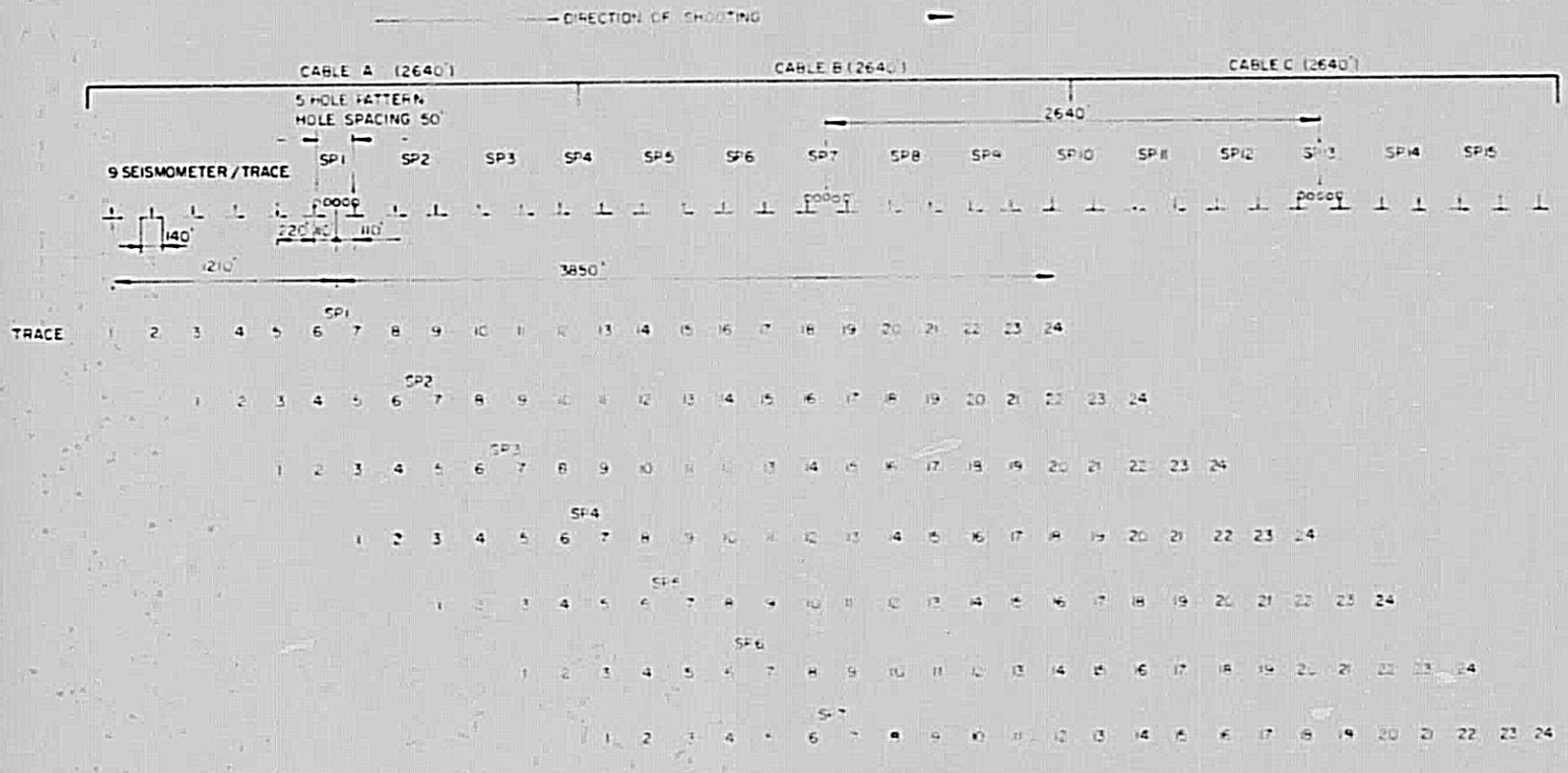
    Playback CHEH filter (26-76) AGC-36 Straight (I)

12. Survey Procedure: (Instrument used, take off control, etc.)

Transit Survey Take-off Well site K.70 (coordinates 0 0)

Vertical Control - Hanging lines tied back

Horizontal Control - Tied in field to existing control



MOVE CABLE A TO FORWARD POSITION

FIGURE II

SEISMOMETER ARRANGEMENT

6:1 STACK ROLL ALONG TECHNIQUE

PROVINCE OF ALBERTA, CANADA

NATIONAL GEOPHYSICAL COMPANY OF CANADA, LTD.