Energy, Mines and Resources Canada
Earth Physics Branch
1 Observatory Crescent
Ottawa Canada
K1A 0Y3

Énergie, Mines et Ressources Canada
Direction de la physique du globe
1 Place de l'Observatoire
Ottawa Canada
K1A 0Y3

Geothermal Service of Canada

Service géothermique du Canada

A STUDY OF WELL LOGS IN THE WESTERN NORTHWEST TERRITORIES AND YUKON TO OUTLINE PERMAFROST THICKNESS AND/OR GAS HYDRATE OCCURRENCE

Hardy Associates (1978) Limited
Calgary, Alberta

Earth Physics Branch Open File Number 84-27
Dossier public de la Direction de la Physique du Globe No. 84-27

290 pages
Price / Prix $55.00

ABSTRACT
Downhole well logs have been analysed for 220 exploration holes drilled between latitudes 60°N and 68°N and longitudes 112°W and 114°W. In each well evidence was sought for evidence of permafrost and/or gas hydrates. Maps and tables summarize the interpretation.

RÉSUMÉ
Les diagraphiés de 220 puits d'exploration situés entre 60° et 68° de latitude nord et entre 112° et 114° de longitude ouest ont été analysées. Dans chaque puits des signes témoignant de la présence de pergélisol ou d'hydrates de gaz naturel, ou des deux, ont été recherchés. L'interprétation est résumé sous formes de cartes et de tableaux.

HARDY ASSOCIATES (1978) LTD.
CONSULTING ENGINEERING & PROFESSIONAL SERVICES

A STUDY OF WELL LOGS IN THE WESTERN NORTHWEST TERRITORIES AND YUKON TO OUTLINE PERMAFROST THICKNESS AND/OR GAS HYDRATE OCCURENCE

Prepared For
SUPPLY AND SERVICES CANADA
(DSS File No. 26SQ. 23235-4-0615)

On Behalf Of
EARTH PHYSICS BRANCH, EMR
Ottawa, Ontario

By
HARDY ASSOCIATES (1978) LTD.
Calgary, Alberta

June 1984
CG-10136
5/449

TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

TABLE OF CONTENTS CONTINUED

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

(Appendix "B", Volume II)

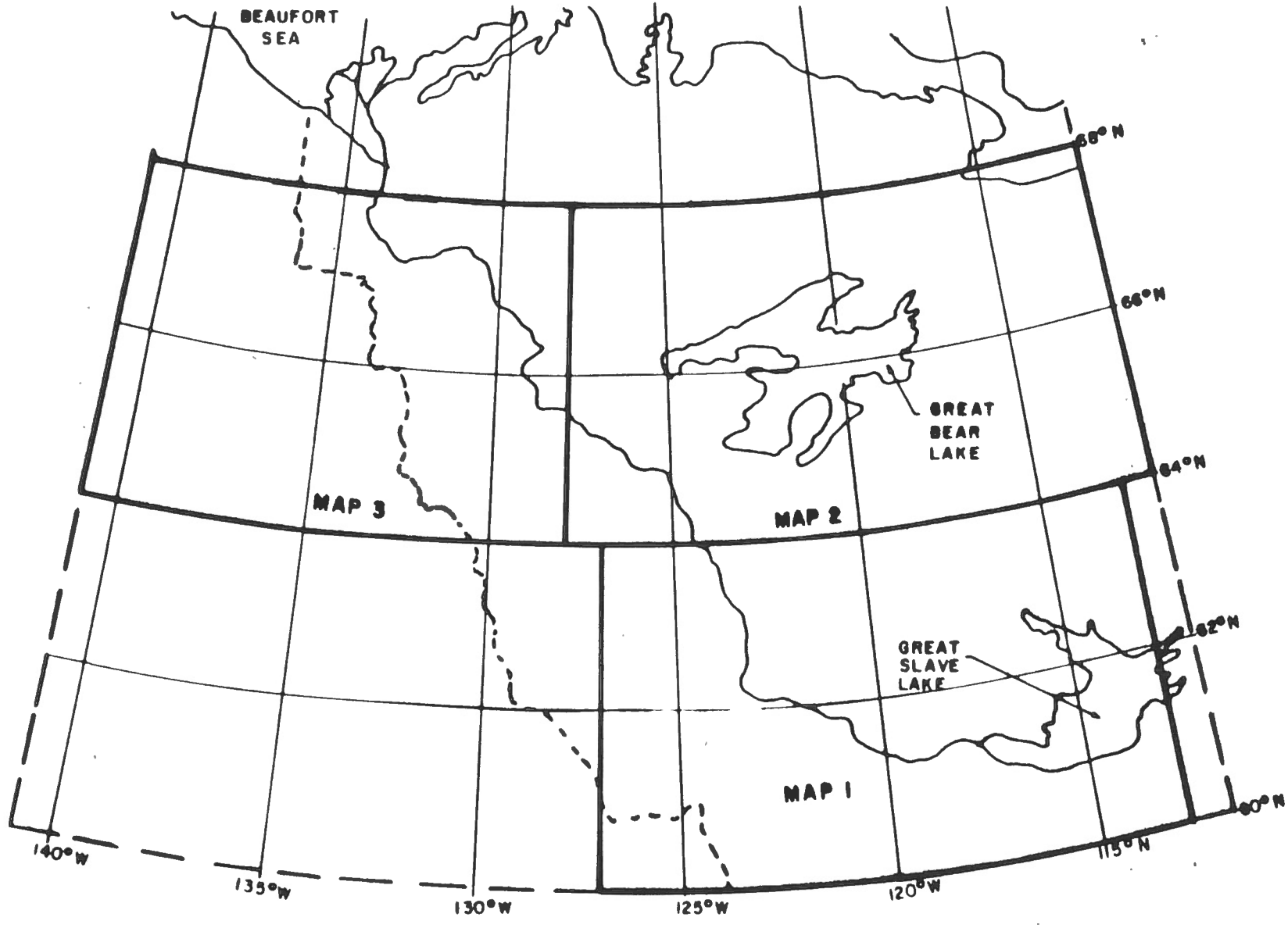
1.0 INTRODUCTION

In April 1984, Hardy Associates (1978) Ltd. was retained by Supply and Services Canada, on behalf of the Earth Physics Branch (Energy, Mines and Resources), to undertake a "Study of Well Logs in the Western Northwest Territories and Yukon to Outline Permafrost Thickness and/or Gas Hydrate Occurrence" Authorization to proceed with the study was received, under DSS Contract No 26SQ.23235-H-0615, dated April 13, 1984.

1.1 SCOPE OF STUDY

According to the "Schedule of Wells, 1920-1979", and supplements, in excess of 600 petroleum exploration wells have been completed in the western Northwest Territories and Yukon, since the first (Northwest Fort Norman No.1) was drilled in 1921. A number of wells have been drilled through permafrost and the presence of natural gas hydrates may be inferred (based on superimposition of ground temperature profiles on methane stability curves), at least locally. The overall objective of the assignment was to "examine well logs taken in the course of petroleum exploration for indications of the presence and thickness of permafrost and/or gas hydrate".

The study area, shown on Figure 1, is located between latitudes 60°N and 68°N and longitudes 112°W and 141°W. For ease of discussion and presentation in the report, the area of interest has been subdivided into seven sections. As shown on Figure 1, each corresponds (excepting the 60°N to 62°N interval) to one degree of latitude.



HARDY ASSOCIATES (1978) LTD.
CONSULTING ENGINEERING & PROFESSIONAL SERVICES

NORTHWEST TERRITORIES YUKON PERMAFROST / GAS HYDRATE STUDY LOCATION PLAN

CG10136

FIGURE 1

HT84-82/03

International Map of the World (1:1 million scale) map sheets have been used for presentation purposes (Appendix "B"). In all, some 220 wells have been included in the study, each of which (with the exception of a number at Norman Wells) had "off-confidential" status as of December 31, 1983. A listing is presented on Table 1. Section 1.3 provides details of the well selection criteria.

It is intended that the results of the study should complement data obtained to date by the Earth Physics Branch, with respect to permafrost thickness and distribution and the occurence of hydrate-prone areas. The study also forms a continuation of previously-completed studies, concerned with permafrost distribution and gas hydrate occurrence in the Arctic Islands (Hardy Associates, 1984) and Mackenzie Delta-Beaufort Sea area (D&S Petroleum Consultants, 1983).

1.2 TERMS OF REFERENCE

Detailed terms of reference were established in the request for proposal and in our proposal dated March, 1984, as follows:

i) Examine downhole logs of all exploratory wells in the area, both on and offshore, that have passed the confidential period, to a depth of 2000 m, and note the presence of frozen horizons.

ii) Review reports on similar studies and survey relevant literature to evaluate past practice and apply the best of currently accepted criteria to all available logs on each well. The major logs to be consulted are crystal

TABLE 1

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
			A. 67°N - 68°W			
1	567	-	Mobil Belot Hills M-63	1972	67° 03'N, 126° 28'W	
2	138	-	Socony Mobil WM Molar Y.T. P-34	1964	67° 04'N, 138° 15'W	
3	578	-	Chevron SOBC WM Whitefish Y.T. I-05	1973	67° 05'N, 137° 15'W	
4	-	-	Richfield Oil et al Grandview Hills No. 1	1960	67° 06'N, 130° 53'W	
5	339	-	Shell Tree River East H-57	1971	67° 06'N, 132° 25'W	
6	454	-	Shell Tree River F-57	1970	67° 06'N, 132° 26'W	
7	154	-	IOE Clare F-79	1965	67° 08'N, 133° 14'W	
8	256	-	IOE Swan Lake K-28	1967	67° 08'N, 133° 35'W	
9	646	-	Chevron SOBC WM Whitefish Y.T. J-70	1973	67° 10'N, 137° 27'W	
10	479	-	Mobil Inexco NCO Sun Manuel Lake J-42	1971	67° 12'N, 129° 23'W	
11	235	-	Atlantic Little Chicago N-32	1966	67° 12'N, 130° 07'W	
12	685	-	Union Mobil Colville D-45	1973	67° 14'N, 125° 09'W	
13	438	-	Mobil Colville E-15	1970	67° 14'N, 126° 18'W	
14	212	-	IOE Nevejo M-05	1966	67° 15'N, 134° 02'W	
15	260	-	IOE Tree River H-38	1967	67° 17'N, 132° 21'W	
16	628	-	Chevron SOBC Gulf Ridge Y.T. F-48	1973	67° 17'N, 137° 54'W	
17	83	-	Amerada et al Bell River Y.T. A-1	1960	67° 20'N, 136° 53'W	
18	375	-	INC NCO Mobil Attoe Lake I-06	1969	67° 26'N, 133° 15'W	
19	206	-	IOE Stony I-50	1966	67° 30'N, 135° 23'W	
20	586	-	Skelly-Getty Amoco Ft McPherson C-78	1972	67° 31'N, 134° 14'W	
21	784	-	Union Imp Stopover K-44	1975	67° 34'N, 123° 39'W	
22	83	-	Richfield et al Pt. Separation No. 1	1960	67° 34'N, 134° 00'W	
23	624	-	Dome Union IOE Stony G-06	1973	67° 35'N, 135° 16'W	
24	603	-	Bluemount et al Gulf South Delta J-80	1973	67° 40'N, 134° 44'W	
25	718	253	Ashland et al Tedji Lake K-24	1974	67° 44'N, 126° 50'W	see Judge et al, 1981

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
			B. 66°N - 67°N			
26	382	-	Triad BP Arco CC Hume R. A-53	1969	66° 02'N, 129° 10'W	
27	564	-	Chevron SOBC WM Birch Y.T. E-53	1972	66° 02'N, 136° 56'W	
28	156	-	Socony Mobil W.M. Birch Y.T. B-34	1965	66° 03'N, 136° 51'W	
29	498	-	SOBC WM E. Porcupine Y.T. I-13	1971	66° 03'N, 137° 47'W	See Pollard and Nash (Fig. 15)
30	682	-	Inexco et al Weldon Creek O-65	1973	66° 05'N, 132° 27'W	
31	118	-	Socony Mobil W.M. Porcupine R. Y.T. K-56	1963	66° 06'N, 137° 56'W	
32	139	-	Socony Mobil et al Whitestone Y.T. N-26	1964	66° 06'N, 138° 20'W	
32A	143	-	Socony Mobil WM Chance Y.T. G-08	1965	66° 07'N, 137° 31'W	
33	583	-	Chevron SOBC WM E. Porcupine Y.T. F-18	1972	66° 07'N, 137° 48'W	
33A	58	-	Western Minerals Chance Y.T. No. 1	1959	66° 08'N, 137° 32'W	
34	769	-	Shell Peel River Y.T. M-69	1974	66° 09'N, 133° 58'W	
35	230	-	Shell Peel River Y.T. I-21	1966	66° 11'N, 134° 19'W	
36	155	62	Socony Mobil WM N. Cath Y.T. B-62	1965	66° 11'N, 138° 42'W	see Taylor and Judge, 1974
37	554	-	Chevron SOBC WM W. Parkin Y.T. C-33	1972	66° 15'N, 134° 50'W	
38	759	-	Gulf Mobil Caribou Y.T. N-25	1974	66° 15'N, 134° 50'W	
39	716	-	ARCO Shell Sainville River D-08	1974	66° 17'N, 133° 32'W	
40	607	-	Decalta Trans Ocean GCOA Ontaratue I-38	1972	66° 18'N, 131° 51'W	
41	435	-	Mobil INC NCO Sun Ontadek L. N-39	1970	66° 19'N, 128° 22'W	
42	257	-	Shell Peel River Y.T. K-09	1967	66° 19'N, 134° 01'W	
43	869	-	Mobil Gulf Peel Y.T. H-71	1977	66° 20'N, 134° 44'W	
44	565	-	Chevron SOBC W.M. N. Parkin Y.T. D-61	1972	66° 20'N, 137° 13'W	see Pollard and Nash (Fig. 16)
45	559	-	Inexco Husky et al Porcupine Y.T. G-31	1972	66° 20'N, 140° 06'W	
46	204	-	Atlantic et al Manitou Lake L-61	1966	66° 21'N, 128° 58'W	
47	89	-	Atlantic S.W. Airport Creek No. 1	1960	66° 21'N, 129° 15'W	
48	122	-	Atlantic et al Ontaratue H-34	1964	66° 23'N, 132° 06'W	
49	563	-	Shell Sainville River K-63	1972	66° 23'N, 133° 12'W	
50	148	-	Socony Mobil W.M. S. Tuttle Y.T. N-05	1965	66° 25'N, 136° 46'W	

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
51	203	-	Shell Peel River Y.T. K-76	1965	66° 26'N, 134° 14'W	
52	90	-	Atlantic N. Circle River No. 1	1961	66° 26'N, 129° 36'W	
53	96	-	Atlantic Circle River No. 1	1961	66° 27'N, 138° 09'W	
54	183	-	Shell Peel River Y.T. J-21	1965	66° 31'N, 134° 04'W	
55	210	-	Shell Peel River Y.T. L-01	1966	66° 31'N, 134° 46'W	
56	144	-	Socony Mobil W.M. Ellen Y.T. C-24	1965	66° 33'N, 137° 50'W	
57	431	-	Western Minerals N. Hope Y.T. N-53	1970	66° 33'N, 138° 26'W	
58	237	-	Shell Peel River Y.T. B-06A	1967	66° 35'N, 134° 46'W	
59	580	-	CanDel et al Mobil Grandview L-26	1972	66° 36'N, 130° 20'W	
60	728	-	Shell Trail River Y.T. H-37	1974	66° 36'N, 134° 51'W	
61	266	-	Shell Peel River Y.T. H-59	1967	66° 38'N, 134° 40'W	
62	464	-	SOBC WM Shaeffer Ck Y.T. O-22	1971	66° 42'N, 137° 20'W	
63	494	-	Shell Arctic Red West G-55	1971	66° 44'N, 133° 10'W	
64	476	-	Shell Arctic Red River O-27	1971	66° 47'N, 132° 50'W	
65	233	-	Shell Peel River Y.T. L-19	1966	66° 49'N, 135° 18'W	
66	534	-	Skelly-Getty Mobil Arctic Red Y.T. C-60	1972	66° 49'N, 133° 55'W	
67	232	-	IOE Martin House L-50	1966	66° 50'N, 133° 24'W	
68	240	-	IOE Satah River G-72	1967	66° 51'N, 134° 14'W	
69	547	-	Pacific et al Peel Y.T. F-37	1972	66° 56'N, 134° 52'W	
70	553	-	Chevron SOBC WM E. Pine Y.T. O-78	1972	66° 58'N, 137° 59'W	
			C. 65°N - 66°N			
71	521	-	SOBC CS Great Bear River N-30	1971	65° 00'N, 124° 05'W	
72	552	-	Aquit. Mobil Dodo Canyon K-03	1972	65° 03'N, 126° 46'W	
73	329	-	Sinclair Wolverine Creek D-61	1969	65° 10'N, 124° 13'W	
74	622	-	Aquit. Brackett Lake C-21	1973	65° 10'N, 125° 05'W	
75	1021	-	Esso Norman Wells N-27X	1982	65° 16'N, 126° 54'W	

TABLE 1 Continued ...

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
76	-	-	Esso Norman Wells N-25X	1982	65° 16'N, 126° 55'W	
77	-	-	Esso Norman Wells P-19X	1982	65° 16'N, 126° 56'W	
78	1008	-	Esso Norman Wells P-15X	1982	65° 16'N, 126° 56'W	
79	944	-	Esso Bear Island No. 22	1979	65° 16'N, 126° 52'W	
80	920	-	Esso Mackenzie River No. 1	1979	65° 16'N, 126° 54'W	
81	1023	-	Esso Norman Wells O-23X	1982	65° 16'N, 126° 55'W	
82	1034	-	Esso Norman Wells P-09x	1982	65° 17'N, 126° 57'W	
83	316	-	Imperial Canol Goose Island (No. 20) L-57	1968	65° 17'N, 126° 56'W	
84	915	-	Esso Norman Wells No. 36X	1978	65° 17'N, 126° 53'W	
84A	-	-	Esso Norman Wells O-36X	1983	65° 20'N, 126° 45'W	
85	954	-	Esso Norman Well (44X) B-48	1980	65° 17'N, 126° 53'W	
86	958	-	Esso Norman Wells (45X) P-37	1980	65° 17'N, 126° 51'W	
87	1004	-	Esso Norman Wells C-37X	1982	65° 17'N, 126° 51'W	
88	-	-	Esso Norman Wells B-35X	1982	65° 17'N, 126° 51'W	
89	1028	-	Esso Norman Wells D-42X	1982	65° 17'N, 126° 50'W	
90	1014	-	Esso Norman Wells D-39X	1982	65° 17'N, 126° 51'W	
91	1002	-	Esso Norman Wells G-30X	1982	65° 17'N, 126° 53'W	
92	1000	-	Esso Norman Wells G-24X	1982	65° 17'N, 126° 54'W	
93	1035	-	Esso Norman Wells F-23X	1982	65° 17'N, 126° 54'W	
94	-	-	Esso Norman Wells B-33X	1983	65° 20'N, 126° 45'W	
95	-	-	Esso Norman Wells C-38X	1983	65° 20'N, 126° 45'W	
96	-	-	Esso Norman Wells K-48X	1983	65° 20'N, 126° 45'W	
97	-	-	Esso Norman Wells M-13X	1983	65° 20'N, 126° 45'W	
98	-	-	Esso Norman Wells N-11X	1983	65° 20'N, 126° 45'W	
99	-	-	Esso Norman Wells N-23X	1983	65° 20'N, 126° 45'W	
100	-	-	Esso Norman Wells N-31X	1983	65° 20'N, 126° 45'W	

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
101	-	-	Esso Norman Wells O-10X	1983	65° 20'N, 126° 45'W	
102	-	-	Esso Norman Wells O-45X	1983	65° 20'N, 126° 45'W	
103	-	-	Esso Norman Wells P-11X	1983	65° 20'N, 126° 45'W	
104	-	-	Esso Norman Wells P-37X	1983	65° 20'N, 126° 45'W	
105	-	-	Esso Norman Wells Q-12X	1983	65° 20'N, 126° 45'W	
106	-	-	Esso Norman Wells Q-17-1X	1983	65° 20'N, 126° 45'W	
107	-	-	Esso Norman Wells R-11X	1983	65° 20'N, 126° 45'W	
108	782	-	BP et al Grey Goose N-70	1975	65° 20'N, 123° 42'W	
109	352	-	Sinclair Mahony Lake I-74	1969	65° 24'N, 124° 44'W	
110	779	-	BP et al Russel M-07	1975	65° 27'N, 123° 32'W	
111	679	-	CanDel Mobil et al S.Ramparts I-77	1973	65° 27'N, 130° 58'W	
112	448	-	Banff Aquit. GPD Oscar Creek J-48	1970	65° 28'N, 127° 08'W	
113	463	-	Mobil Hume River L-09	1971	65° 29'N, 129° 32'W	
114	445	-	Banff Aquit GPD Oscar Creek H-71	1970	65° 30'N, 127° 13'W	
115	540	-	Amoco PCP A-1 Cranswick A-22	1972	65° 31'N, 131° 49'W	
116	536	151	ARCO West Whitefish River H-34	1973	65° 33'N, 124° 36'W	see Taylor and Judge, 1975
117	778	-	BP et al White M-04	1975	65° 34'N, 123° 47'W	
118	382	-	Triad BP Arco CC Carcajou L-24	1970	65° 34'N, 128° 50'W	
119	446	-	McD Can GCO S. Maida Creek G-56	1970	65° 35'N, 128° 10'W	
120	441	-	McD Can GCO Maida Creek F-57	1970	65° 36'N, 128° 10'W	
121	328	-	Sinclair Whitefish River K-76	1969	65° 36'N, 124° 29'W	
122	635	-	CanDel Et al Texaco Arctic Red F-47	1973	65° 36'N, 130° 53'W	
123	737	-	TPPL et al Carcajou J-27	1974	65° 37'N, 128° 34'W	
124	577	-	Amoco et al Carcajou K-68	1972	65° 38'N, 128° 12'W	
125	537	-	ARCO Lost Hill Lake F-62	1972	65° 41'N, 123° 12'W	

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
126	597	-	Amoco PCP B-1 Cranswick Y.T. A-42	1973	65° 41'N, 133° 08'W	
127	589	-	CanDel et al SOBC Mountain R. A-23	1972	65° 42'N, 129° 19'W	
128	686	-	Mesa Murphy CGOA Hanna River J-05	1973	65° 45'N, 128° 16'W	
129	538	-	ARCO Clarke et al Mountain River H-47	1972	65° 46'N, 129° 08'W	
130	109	-	SOBC Blackstone Y.T. D-77	1963	65° 46'N, 137° 15'W	
131	598	-	Inexco et al Mallard Y.T. O-18	1972	65° 48'N, 140° 18'W	
132	234	-	Atlantic et al Shoals C-31	1966	65° 50'N, 128° 52'W	
133	806	-	BP et al Losh Lake G-22	1975	65° 51'N, 123° 20'W	
134	539	100	ARCO Clarke et al Hume River D-53	1972	65° 52'N, 129° 11'W	see Taylor and Judge (1974)
135	383	-	Triad BP Arco CC Hume R. O-62	1970	65° 52'N, 129° 12'W	
136	901	-	Aquitaine Alder Y.T. C-33	1979	65° 52'N, 136° 55'W	
137	571	-	Chevron SOBC Imp S. Chance Y.T. D-63	1972	65° 52'N, 137° 43'W	
138	688	-	Dome Texaco Imp South Peel D-64	1974	65° 53'N, 132° 28'W	
139	205	-	Atlantic et al Beavertail G-26	1966	65° 55'N, 128° 34'W	
140	330	-	McD GCO Northup Taylor Lake Y.T. K-15	1969	65° 55'N, 133° 03'W	
141	397	-	INC Husky Amoco Blackfly Y.T. M-55	1970	65° 55'N, 140° 26'W	
142	645	-	Murphy Mesa PB Whitestone Y.T. N-58	1973	65° 58'N, 138° 26'W	
143	125	-	Socony Mobil W.M. Blackie No. 1 Y.T. M-59	1964	65° 59'N, 137° 11'W	
			D. 64°N - 65°N			
144	134	-	Shell Blackwater Lake G-52	1964	64-65° 01'N, 122° 55'W	
145	570	-	Decalta et al Dome Keele S. A-28	1972	64° 07'N, 125° 04'W	
146	655	-	Decalta CS Mesa Redstone P-78	1973	64° 08'N, 124° 28'W	
147	561	-	Amoco Candex Shell A-1 Red Dog K-29	1972	64° 09'N, 125° 35'W	
148	467	-	Cdn. Res. Signal Keller Lake O-13	1971	64° 13'N, 122° 17'W	
149	468	-	Cdn. Res. Signal Keller Lake P-14	1971	64° 14'N, 122° 32'W	
150	572	-	CanDel DECLRI et al Stewart B-30	1972	64° 19'N, 125° 19'W	

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
151	460	-	Decalta LRI et al Keele River I-01	1971	64° 21'N, 125° 00'W	
152	141	-	Shell Keele River L-04	1965	64° 24'N, 125° 02'W	
153	557	-	CanDel DECKMG et al Tate J-65	1972	64° 25'N, 125° 27'W	
154	488	-	Buttes et al Blackwater Lake I-54	1971	64° 34'N, 122° 40'W	
155	594	-	Candex Amoco Shell Little Bear I-70	1972	64° 40'N, 125° 57'W	
156	497	-	Candel DECKMG et al East Mackay B-45	1971	64° 44'N, 125° 38'W	
157	496	-	Candel DECKMG et al Police Island L-66	1971	64° 46'N, 125° 13'W	
158	620	-	Aquit. Old Fort Point E-30	1973	64° 49'N, 124° 50'W	
159	458	-	SOBC CS St. Charles Creek H-61	1971	64° 50'N, 123° 56'W	
160	675	-	CS et al Bluefish K-71	1973	64° 51'N, 126° 00'W	
161	596	-	Candel DECKMG et al Ft Norman K-14	1972	64° 54'N, 125° 18'W	
162	444	-	Mobil et al Slater River A-37	1970	64° 56'N, 126° 06'W	
			E. 63°N - 64°N			
163	665	-	HB Gulf Fish Lake G-60	1973	63° 09'N, 122° 55'W	
164	140	-	Shell Wrigley G-70	1965	63° 09'N, 124° 12'W	
165	72	-	Imperial Cartridge F-72	1960	63° 11'N, 120° 29'W	see Pollard and Nash (Fig 17)
166	123	-	Shell Ochre River P-15	1964	63° 25'N, 122° 47'W	
167	664	-	Decalta SOBC Gulf Am Min Johnson A-12	1973	63° 31'N, 124° 02'W	
168	71	-	Imperial Lac Tache C-35	1960	63° 44'N, 120° 37'W	
169	569	-	Union Japex Blackwater E-11	1972	63° 40'N, 123° 04'W	
170	710	-	Aquit. Silvan Plateau G-51	1974	63° 50'N, 125° 25'W	
171	487	94	Candex et al Dahadinni M-43A	1971	63° 53'N, 124° 39'W	see Taylor and Judge (1975)
172	556	-	Decalta et al Champlin Dahadinni D-65	1972	63° 54'N, 124° 28'W	
173	153	-	Shell Cloverleaf I-46	1965	63° 56'N, 124° 53'W	
174	513	-	Cdn. Res. Signal Keller Lake F-49	1971	63° 58'N, 121° 54'W	

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
			F. 62°N - 63°N			
175	360	-	IOE Trail River P-13	1969	62° 03'N, 121° 32'W	
176	359	-	Gulf Amerada Cli Lake G-15	1969	62° 04'N, 123° 03'W	
177	332	-	BAOH Amerada Cli Lake K-54	1969	62° 04'N, 123° 10'W	
178	465	-	Fina et al Willow Lake L-59	1971	62° 09'N, 121° 56'W	
179	68	-	Imperial Triad Davidson Creek P-02	1960	62° 12'N, 118° 15'W	
180	70	-	Imperial Triad Willow Lake B-20	1960	62° 17'N, 119° 04'W	
181	405	-	Husky et al Willow Lake 0-27-A	1970	62° 17'N, 121° 04'W	
182	131	-	IOE Triad Ebbutt D-50	1964	62° 19'N, 122° 24'W	
183	137	-	IOE Triad Ebbutt J-70	1964	62° 20'N, 121° 57'W	
184	72	-	Imperial Triad Harris River F-71	1960	62° 20'N, 120° 15'W	
185	417	-	Husky HB et al Willow Lake G-32	1970	62° 21'N, 120° 51'W	
186	363	-	Chevron CS Ebbutt G-72	1969	62° 21'N, 122° 29'W	
187	484	-	Horn R. Gulf Amhess Berry Island A-42	1971	62° 21'N, 123° 08'W	
188	353	-	Chevron Hornell Lake G-24	1969	62° 23'N, 119° 35'W	
189	493	-	Horn River Shell Levis D-76	1971	62° 25'N, 118° 30'W	
190	491	-	Horn River Candel et al Ebbutt J-05	1971	62° 25'N, 122° 16'W	
191	346	-	Chevron Harris River A-31	1969	62° 30'N, 120° 06'W	
192	345	-	Chevron CS Berry F-71	1969	62° 30'N, 122° 59'W	
193	649	-	Aquit Highland Lake K-42	1973	62° 32'N, 122° 23'W	
194	648	-	Aquit Highland Lake I-23	1973	62° 33'N, 122° 19'W	
195	490	-	Horn River Candel et al Willowlake G-47	1971	62° 36'N, 122° 53'W	
196	114	-	FPC Tenneco Root River I-60	1963	62° 40'N, 123° 24'W	
197	512	-	Horn River CDR IOE Willowlake R. I-71	1971	62° 41'N, 121° 43'W	
198	575	-	HB et al Willow A-39	1973	62° 48'N, 122° 51'W	
199	416	-	Husky HB et al Willow Lake H-10	1970	62° 49'N, 121° 45'W	
200.	77	-	Imperial Windflower G-77	1960	62° 56'N, 118° 59'W	

NORTHWEST TERRITORIES-YUKON WELLS INCLUDED IN THIS STUDY

Well No.	Drilling Authority No.	Earth Physics Branch No.	Well Name	Year Completed	Location	Comments
			G. 61°W - 62°W			
201	387	-	IOE Sun Blackstone E-72	1969	61° 11'N, 122° 15'W	
202	320	-	Pan Am A-2 Grainger C-42	1968	61° 12'N, 123° 09'W	
203	425	-	HB Great Plains Simpson D-25	1970	61° 14'N, 121° 50'W	
204	351	-	Cdn. Super KMG Jean Marie N-73	1969	61° 23'N, 120° 44'W	
205	290	70	IOE Providence A-47	1968	61° 26'N, 117° 23'W	see Taylor and Judge (1974)
206	309	-	GPD Noel Mills Lake P-52	1968	61° 32'N, 116° 40'W	
207	146	-	Calstan Mills Lake C-03	1965	61° 12'N, 118° 01'W	
208	507	-	Horne River Decalta et al Trout R.D-66	1971	61° 35'N, 119° 58'W	
			H. 60°W - 61°W			
209	354	-	Fina Gulf Trainor Lake G-07	1969	60° 16'N, 119° 46'W	
210	506	-	Atkinson CSP Trout Lake M-51	1971	60° 21'N, 121° 11'W	
211	314	-	Pan Am Pointed Mountain G-62	1969	60° 21'N, 123° 57'W	
212	343	-	Shell HB Grumbler I-72	1969	60° 22'N, 115° 43'W	
213	747	-	Tex. Amoco N. Tathlina I-72	1974	60° 22'N, 118° 13'W	
214	654	-	Pacific HB Alexandra O-54	1973	60° 24'N, 117° 55'W	
215	404	-	Gobles et al Celibeta D-66	1970	60° 25'N, 122° 28'W	
216	311	-	Shell H.B. Grumbler F-07	1968	60° 26'N, 116° 01'W	
217	209	-	Union Pan Am Trainor L-59	1966	60° 29'N, 120° 41'W	

cable, sonic, resistivity, induction, self-potential and caliper logs.

iii) Produce a brief report, outlining the techniques used to define permafrost and hydrates, supporting the "picks" and their reliability and reviewing the results obtained through concise tables and maps.

1.3 METHODOLOGY

The assignment was carried out in four main stages.

1.3.1 Review of Existing Information and Previously Developed Evaluation Criteria

Firstly, available sources of published and unpublished information, pertinent to the requirements of the study, were reviewed. Reference was made to three main types of data source:

i) Earth Physics Branch (E.P.B.) publications, concerning the distributions of ground temperatures, permafrost and hydrate-prone areas.

ii) Published interpretations of permafrost and hydrate occurrence, based on downhole well logs, and those released by the operators.

iii) Published interpretations for other areas, primarily the Mackenzie Delta-Beaufort Sea area, Arctic Islands, and Alaska.

Emphasis was placed throughout on gaining an overall impression of permafrost and hydrate distribution in the

western Northwest Territories and Yukon. As detailed in Sections 3.1 and 4.1, existing site-specific data are sparse.

In addition to the literature review, the initial phase also included a review of diagnostic criteria previously developed (during the Arctic Islands assignment) for identifying permafrost thickness and hydrate occurence using downhole petrophysical logs. As previously, procedures and criteria were refined and improved as the initial stages of log interpretation proceeded.

1.3.2 Selection of Wells for Detailed Interpretation

In the order of 640-650 exploratory wells have been drilled to date within the study area. However, reference to the Permafrost Map of Canada (Brown, 1967) and a review of EPB ground temperature profiles (relative to the stability curve for methane hydrate), suggests that many of those within the southern part may not have penetrated either permafrost (which was either absent, too shallow to be noted on logs, or (possibly) relict) or hydrates (geothermal gradients appear to be too high in most EPB instrumented wells).

The second project task comprised selection of wells for detailed interpretation. Main selection criteria adopted were:

i) Known permafrost distribution (bearing in mind historic permafrost boundary changes and the potential for relict permafrost)

ii) Projected distribution of gas hydrates (EPB temperature data suggested hydrates might be confined to thick permafrost areas in the north and away from the Mackenzie River)

iii) Well log availability (in general, wells for which logs were readily available from Riley's Datashare were favoured).

Final selection was made by reference to the "Schedule of Wells".

1.3.3 Petrophysical Log Interpretation

Log interpretation was carried out for the wells in each one degree latitude interval, in order from north to south through the study area. Within each interval, the procedure was as follows:

Logs of wells for which interpretations of permafrost and/or hydrate occurence have already been published, or released by the operators, were firstly examined. Of this group, data on the wells for which precise temperature surveys are available (carried out either by the Earth Physics Branch (E.P.B.)) were reviewed initially, and then those for which industry temperature survey data are available. In both cases, all available logs were examined, so as to provide either support for the published interpretation or, if necessary, a revised or alternative interpretation. Finally, the logs of wells for which existing interpretations are not available were examined. Using the diagnostic criteria developed, permafrost thickness and/or hydrate occurence were "picked". Wherever

possible, wells with existing temperature data were examined first.

1.3.4 Report Preparation

Preparation and submission of this report constituted the final study task. It outlines the diagnostic logging criteria and presents the results of the investigation.

1.4 PROJECT TEAM

The assignment was carried out by Hardy Associates (1978) Ltd., Calgary, Alberta, with petrophysical logging expertise provided, on a sub-contract basis, by Petrophysical Consultants International Ltd. Key personnel were as follows.

Mr. I. Jones, M.Sc., P.Geol., of Hardy Associates was project manager, responsible for overall supervision of the assignment, review of existing literature, well selection and final report preparation.

Mr. G.E. Dawson-Grove, P.Eng., P.Geol., of Petrophysical Consultants International, reviewed the diagnostic criteria and carried out the petrophysical log interpretation.

Mr. N. Mosley, M.Sc., P.Geol., of Hardy Associates had the day-to-day responsibility for study organization, and provided input to well selection and final report preparation.

Dr. J.F. Nixon, P.Eng., of Hardy Associates, was project director and provided an internal review.

1.5 ACKNOWLEDGEMENTS

Well logs were obtained on a commercial basis from International Petrodata Inc. of Calgary. The "blown-down" copies of well logs, for the side-by-side presentations, were provided by Riley's Datashare International Ltd., also of Calgary.

2.0 DIAGNOSTIC CRITERIA

This section describes the criteria adopted to determine permafrost thickness and the occurence of natural gas hydrates. Following a review of pertinent definitions and concepts, petrophysical and other log response to the occurence of permafrost and hydrates is outlined, based on theoretical considerations and a review of the literature. With this basis, Sections 2.4 and 2.5 detail the diagnostic techniques developed, and improved upon, in this study and the previously-completed Arctic Island project, to determine permafrost thicknesses and natural gas hydrate occurence. A brief summary is presented in Section 2.6.

2.1 DEFINITIONS AND CONCEPTS

2.1.1 Permafrost

Permafrost, or perennially frozen ground, is the thermal condition that exists when the ground (whether rock or unconsolidated material) remains at a temperature below $0^{o}c$ for two or more years.

An important implication of this temperature-based definition is that it does not require the ground to be frozen. Materials containing ice in the pore spaces and those that do not may, thus, both be considered as permafrost, provided the temperature condition (i.e. remaining at less than $0^{o}C$ for a minimum of two years) is met. Since the application of petrophysical techniques in this study is dependent on the recognition of physical changes in log response due to the presence of ice, it is convenient to separate the two conditions, as suggested by Osterkamp and Payne (1981). The former, therefore, is denoted as ice-bearing permafrost (IBPF) and the latter as permafrost per se (defined, as above, solely on the basis of temperature).

The base of permafrost corresponds to the position of the $0^{o}C$ ground temperature isotherm at depth; as such, permafrost thickness may be accurately delineated only on the basis of precise temperature surveys. On the other hand, the base of ice-bearing permafrost (IBPF), may be determined, as shown in this study, based on interpretation of petrophysical (downhole) well logs. These reflect the physical changes that occur in response to the phase change from pore water to ice.

The bases of permafrost and ice-bearing permafrost rarely, if ever, correspond, since there is generally a marked difference in temperature at the two depths. This temperature difference, termed the freezing point depression (FPD), is a function of pressure, chemical and soil particle effects (Osterkamp and Payne, 1981). D&S Petrophysical Consultants (1983) suggest FPD may range from about $1.28^{o}C$ in coarse grained sands to as much as $8.24^{o}C$ in shales. The impact of FPD may be illustrated by an example. Thus, assuming an

average geothermal gradient of 30°C/km and the above FPD values, the base of IBPF can be shown to vary from about 43 m above the 0°C isotherm in clean (i.e. non-shaly) sands to over 275 m above the isotherm in shales. An implication is that the lowest "ice" indications, picked from the electrical logs, in any well may actually be the lowest levels of gas hydrate occurence. In this case, the base of permafrost could be at an appreciably higher level.

Most well logs also exhibit a transition zone below the IBPF base, within which the resistivity and sonic travel times gradually change. The results of this study indicate the thickness of the transition zone may range from about 10 m to greater than 100 m. Likely, this is again a function, at least in part, of lithology (i.e. proportion of shale). Thermodynamically, however, ice and water will co-exist in fine pore spaces, so that the transition zone likely also represents the increasing unfrozen water content as the melting point is approached (Desai and Moore, 1968).

2.1.2 Natural Gas Hydrate

Natural gas hydrates, or clathrates, are solid, ice-like, mixtures of natural gas and water which, under pressure, can form at temperatures considerably above the freezing point of water.

The hydrate structure consists of a latticework of water molecules held together by hydrogen bonds, with the gas molecules filling the voids. According to Davidson et al (1978), gas hydrates may be of two main types: Structure I formed by "small" gas molecules, such as methane and ethane,

and Structure II containing larger molecules, such as propane and isobutane.

A typical phase diagram for the methane-water system is presented on Figure 2. As shown by Judge (1982) and others, superimposition of a measured ground temperature profile on to this type of diagram, can provide an appreciation of whether or not the area is hydrate-prone and, if so, the likely thickness of the hydrate-bearing interval.

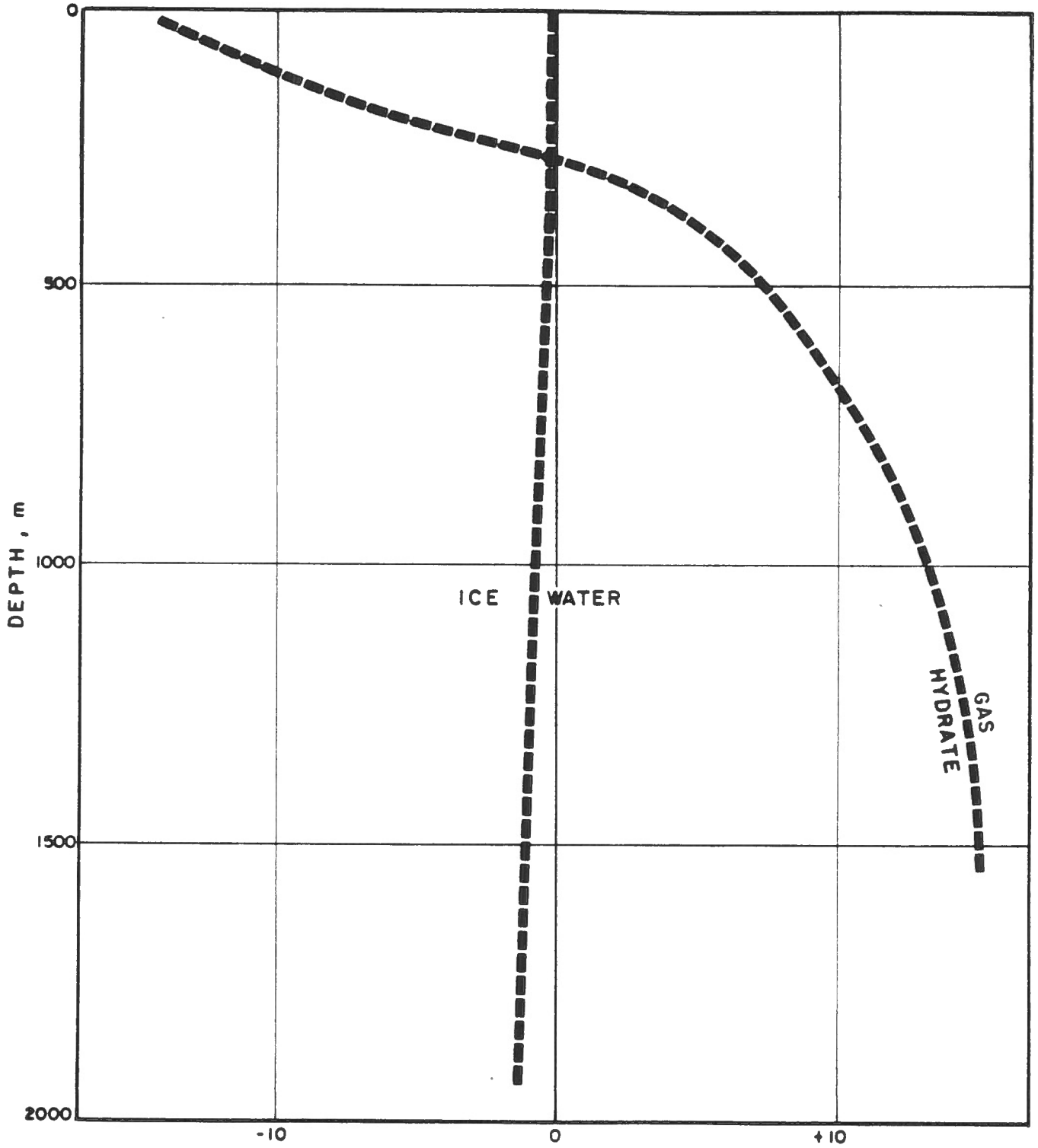
2.2 PETROPHYSICAL LOG RESPONSE

Up to four individual logs (run in varying combinations) are typically available for wells drilled within the Western Northwest Territories and Yukon. In most instances, the log exhibits a characteristic response as the logging tool moves up-hole, from unfrozen material into ice-bearing permafrost and through zones that may or may not contain natural gas hydrates.

The petrophysical response (or lack thereof) is categorized in the sections that follow, based both on theoretical considerations and actual experience. Reference is made also to the results of earlier studies reported in the literature. Features that are of particular value in delineating IBPF and/or hydrate zones are highlighted.

2.2.1 Resistivity Logs (IES, EL, IND E, DILL, DISFL, ML-C, etc.)

In general, frozen porous formations are considerably more resistive than similar non-frozen materials so that an abrupt increase in resistivity can be expected at the base of IBPF.



HARDY ASSOCIATES (1978) LTD.
CONSULTING ENGINEERING & PROFESSIONAL SERVICES

METHANE STABILITY CURVE

CG10136

FIGURE 2

HT83-82/03

As noted by Hnatiuk and Randall (1977), however, this may not always be the case, since the resistivity increase may be masked by the effects of thermal invasion around the well bore. Indications on the resistivity log (in combination with other features, such as drift in the spontaneous potential log) were used, in the majority of wells, as the primary indicator of the IBPF base.

Resistivity logs, generally of the Electrical Log (EL), Induction Electrical (IND E), Microlog (ML), or Dual Induction Laterolog (DILL) types are available for all wells considered (see individual Analysis Details, Appendix "A").

2.2.2 Sonic (Acoustic) Logs (BHCS, S, AC

Based on laboratory studies, it is well documented that sonic (acoustic) velocities in porous formations are higher at low temperatures (i.e. when ice is present) than they are at higher temperatures. A distinct shift from low to high velocity could be expected, on this basis, when passing up-hole into ice-bearing permafrost or through a hydrate zone (assuming a material of relatively uniform lithology and porosity). In practice, the opposite is frequently the case, since thermal invasion and thawing cause the borehole walls to crumble and wash out, in both permafrost and hydrate-bearing zones. The result is "cycle skipping" that gives rise to spuriously slow travel times which completely obscure the real (faster) values.

"Cycle skipping" may be put to use as a permafrost and (especially) hydrate indicator (Sections 2.4 and 2.5). It needs to be borne in mind, however, that other features (e.g.

high porosity sands, presence of gas, fracturing) can also give rise to very slow acoustic travel times and cycle skipping. It is preferable, for this reason, to use a number of logs in combination rather than a single log to pick IBPF and/or hydrates.

Sonic logs are available for almost all the N.W.T.-Yukon wells. These are, in most instances, of the borehole-compensated type (BHCS); however, acoustic (AC) and non-compensated sonic (S) logs have also been run in some wells.

2.2.3 Spontaneous Potential Log (SP)

The SP curve records the difference in potential between a moveable electrode in the well and a fixed surface electrode (Hnatiuk and Randall, 1977). Characteristically, it shows a negative drift while moving uphole through permafrost, the start of which can often be used to locate the IBPF base or to confirm the pick determined from analysis of the resistivity logs. In a number of wells, SP drift is also visible within a number of discrete zones down to considerable depth. Often, these "ice indications" seem to correspond to interpreted hydrate occurences (see Figure 28, Appendix "B"); however, this is not always apparently the case (see Figure 29).

It has been proposed that SP drift may be related to an increase in pore water salinity with depth (Desai and Moore, 1968; Pollard and Nash, 1971); however, according to Hnatiuk and Randall (1977), this is not proven. Collett (1983) suggests, further, that "there is a relatively lower (less negative) spontaneous potential deflection in a hydrate zone when compared to that associated with free gas".

SP logs are available, generally in combination with the resistivity log, for almost all wells considered.

2.2.4 Gamma Ray Log (GR)

This log, generally run in conjunction with the sonic and caliper, measures the natural radiation of the formations surrounding the well bore. As might be expected, passing uphole into ice-bearing permafrost and/or through a hydrate zone has no direct influence on the GR log. However, the log is of value for determining the distribution of sand (as opposed to shale) horizons and, thus, potential hydrate-bearing zones. Non-correspondence of the GR and SP is often an indication of IBPF or hydrate intervals (see Section 2.6).

Gamma ray logs are available for almost all the interpreted wells.

2.2.5 Caliper Log (C)

Drilling through permafrost and/or hydrates, using conventional mud, leads to the creation of a zone of thermal invasion. In all but the most competent formations, development of an overgauge hole often results, due to thawing, caving and hydrate decomposition. Such effects may range in severity from a mild rugosity of the borehole wall to a gross washout. They are readily identified on the caliper log.

Caliper surveys, usually run in combination with the sonic and density/neutron logs, are available for almost all wells in the study area.

2.2.6 Formation Density Log (FD, FDEN), CD)

A density difference exists between ice and water and also, probably, between gas hydrate and ice. Since the water, ice and/or hydrate components of any rock occupy only the pore spaces, the ability of the density log to distinguish between fluids or other substances within naturally occurring rock masses is significantly reduced. As a result, differences in density are likely too small to be recognizable directly.

Thawing of permafrost and decomposition of hydrates (due to an increase of temperature or decrease in pressure beyond critical levels) may, however, result in crumbling or even gross washout of the borehole walls. Since the density log is sensitive to hole irregularities (it becomes distorted to the point of being useless in a washed-out hole), it can indirectly indicate the presence of IBPF and/or hydrates. It may be noted, however, that in reacting in this manner, the density log is actually providing no more information than the caliper. Furthermore, hole rugosity (and washouts) can be caused by a variety of factors other than thawing permafrost and/or decomposing gas hydrates.

Density logs are available for the majority of NWT-YT wells. They are run singly (FDEN) or with the compensated neutron (FD, CD).

2.2.7 Neutron Logs (CN, SNP, GRN)

The neutron log responds to hydrogen ion concentration, small differences in which may exist between rock containing water, ice and gas hydrates. Such differences are very small,

however, so that although theoretically possible (Collett, 1983), it is unlikely the neutron log can be used in practice to distinguish between permafrost, unfrozen materials and gas hydrate-bearing rock, directly.

Like the density log, however, modern (pad-type) neutron tools are sensitive to hole washout. Thus, both "sidewall neutron" (especially) and the "compensated neutron" logs may indicate permafrost and gas hydrate occurence indirectly, by reacting to hole rugosity or washout. Non pad-type neutron tools, on the other hand, are relatively insensitive to hole conditions and will contribute little or nothing to recognition of permafrost and hydrates.

All neutron logs are very sensitive to the presence of shale. As a result, even under perfect hole conditions, variations in the shale content of sands will likely mask any effects due to small variations in hydrogen ion content (associated with permafrost, unfrozen water bearing rock and gas hydrate bearing rock).

Neutron logs are available for most of the wells considered. The "sidewall neutron porosity" (SNP) is predominant; however, "compensated neutron" (CN) logs, as well as the old standard gamma ray neutron (GRN).

2.2.8 Temperature Log (TEMP)

Temperature surveys (run using a downhole tool, rather than a precise thermistor probe) are available for a number of wells. As described by Pollard and Nash (1971), the base of ice-bearing permafrost is generally indicated by a "plateau-like"

feature; this is accompanied by a marked change in temperature gradient. The temperature log often provides confirmation of IBPF "picks" derived from other sources (e.g. resistivity logs). However, the gradient change may also drift uphole with time.

2.3 OTHER DATA SOURCES

In addition to the petrophysical logs, mud gas logs, crystal cable data and detailed (E.P.B.) temperature surveys are also available for a very limited number of wells. Characteristics of these data sources are described below.

2.3.1 Mud Gas Logs

This log provides a continuous record of drilling mud gas returns and, according to Collett (1983), "... serves as the best tool available for the differentiation of a hydrate saturated unit from gas-free ice-bearing permafrost". It was our experience, during the Arctic Island study, that mud gas log peaks do indeed give confirmation of hydrate "picks" derived from other sources (e.g. sonic logs). Some caution is necessary, however, since the logs may also exhibit relatively continuous gas shows related to water-bearing sands, that contain dissolved gas, or to continuing degradation of hydrates drilled through previously (i.e. higher in the well).

According to the Schedule of Wells, mud gas logs are available for only two wells. Due to constraints of time, these were not reviewed.

2.3.2 Crystal Cable Data

Crystal cable (downhole seismic velocity) surveys were available for a very limited number of wells, according to the Schedule of Wells. As noted by Hnatiuk and Randall (1977), "by recording seismic wave first arrival times to geophones suspended in the well from shot holes displaced horizontally from the well bore, a velocity plot which is not significantly influenced by the zone of thermal invasion can be plotted". Walker and Stuart (1976) have described the successful use of this technique in the Mackenzie Delta area.

In this study, crystal cable data were not reviewed due to constraints of time (the Schedule of Wells indicates data are available for only three wells).

2.3.3 Detailed Temperature Surveys

Precise temperature surveys, which provide the only conclusive means of determining depths to the $0^{o}C$ isotherm (and, thus, permafrost thickness), are available for six NWT-YT wells. These data, collected by the Earth Physics Branch, EMR, form part of the Canadian Geothermal Data Collection - Northern Wells. Pertinent information is presented on Table 2; as described in Section 3.3.1, the E.P.B. data constitute a control on the results of the present study. In all instances, E.P.B. depths to the $0^{o}C$ isotherm have been converted to depths below kelly bushing (K.B.).

2.4 DETERMINATION OF PERMAFROST THICKNESS

The base of permafrost (IBPF) was picked in four main steps:

i) Firstly, E.P.B. data on depth to the base of permafrost (0°C isotherm) were reviewed for the well, if available. The objective was to gain an appreciation of the likely frozen ground thickness to be anticipated.

ii) Resistivity and spontaneous potential logs were then examined. Moving uphole, an attempt was made to identify a relatively abrupt increase in resistivity that was associated with a negative drift in SP. Once this had been done (resistivity increase - SP drift was used to pick the base of IBPF in the great majority of wells), the presence or absence of a transition zone below the IBPF base was determined.

iii) After the likely bases of IBPF and the transition had been identified, (based on resistivity and SP), the other logs were reviewed to provide confirmation. As described in Section 2.2, indications of IBPF include: hole washout, shown on the caliper (and often reflected in the neutron and density logs), non-correspondence between SP and gamma ray and cycle-skipping on the sonic. The selected IBPF and transition base depths were then confirmed or modified, as necessary.

iv) Finally, a reliability factor was assigned to each pick, ranging from 1 (good) to 3/3⁻ (poor/very poor).

Interpreted IBPF and transition base depths are shown on the individual analysis detail sheets (Appendix "A") and the side-by-side log presentations (Appendix "C"). The results are summarized on Table 2, and described in Section 3.0.

2.5 IDENTIFICATION OF GAS HYDRATE OCCURENCE

Hydrates form where gas is present and their occurrence follows the same rules as apply for any other hydrocarbon accumulation: a porous reservoir host rock and a trapping mechanism are both required. Hydrates occur preferentially in sand (or occasionally silt) units, and are found either throughout or at the top of the unit (since gas gravitates upward). More is needed than merely high pressure and low temperature conditions for hydrates to be present; even if pressure/temperature conditions are favourable, hydrate may or may not be present, or extend to the limits of the theoretical hydrate envelope (Figure 2).

With these considerations and the previously-described diagnostic criteria in mind, gas hydrate occurrence was interpreted as follows:

i) By reference to the methane stability curve and using measured temperature (E.P.B.) data from the closest instrumented well, the likely presence or absence of hydrates (at the well or in the general area) was determined. If the likely presence of hydrates was indicated, the approximate limits of the hydrate-prone zone was also noted. These data were used as primary indicators for the interpretation; in practice, logs for all wells were reviewed, whether or not the presence of hydrates was anticipated.

ii) The occurence of likely hydrate-bearing intervals (i.e. sands) within the hydrate-prone zone was next determined, based on a review of the gamma ray log.

Low GR readings opposite shales, due to grossly washed-out hole, were "screened out" by reference to the caliper log.

iii) The likely presence of hydrates in the sands was then identified by reference to the other logs, as outlined in Section 2.2. Indications include: non-correspondence between SP and gamma ray, evidence of hole washout on the caliper and density or neutron (the density correction curve was often a good indicator), cycle skipping on the sonic log, "tracking" of the GR and sonic and "hour-glassing" of the caliper and sonic.

iv) Finally, the hydrate "picks" were compared with peaks on the mud gas logs, where available.

Results of the hydrate interpretation are shown on the individual analysis detail sheets (Appendix "A") and on the side-by-side presentations (Appendix "C"). In each instance, the estimated reliability of the pick is indicated, ranging from good (1, "hydrate") to fairly good (2, "? hydrate") to poor (3, "possible hydrate") to very poor (3^{-}). The results are summarized on Table 2, with respect to limits of the hydrate-prone zone and overall thickness.

2.6 SUMMARY

The diagnostic criteria developed in the preceeding sections may be summarized, in point form, as follows.

2.6.1 Indications of the Base of Ice-Bearing Permafrost

In moving uphole, the following may be used, generally in combination, as indicators of the base of IBPF:

i) a relatively abrupt increase in resistivity
ii) a negative drift of the S.P. log
iii) hole washout, shown by the caliper log
iv) non-correspondence between the S.P. and gamma ray logs
v) cycle skipping on the sonic log, due to hole washout.

On most wells the presence of a transition zone, of variable thickness, below the IBPF base is also indicated.

2.6.2 Gas Hydrate Indications

When reviewing the petrophysical logs, the following were used to interpret occurences of natural gas hydrate:

i) a low gamma ray reading, indicating sand; plus
ii) cycle skipping on the sonic log
iii) non-correspondence between the S.P. and gamma ray logs
iv) some degree of hole washout (on caliper)
v) location in sand bodies (throughout or at top)
vi) "tracking" of the GR and sonic logs and tendency for the caliper and sonic to "hour-glass"
vii) peaks on the mud gas log, if available.

It should be emphasized that, in both permafrost and gas hydrate delineation, all available log (and other) information

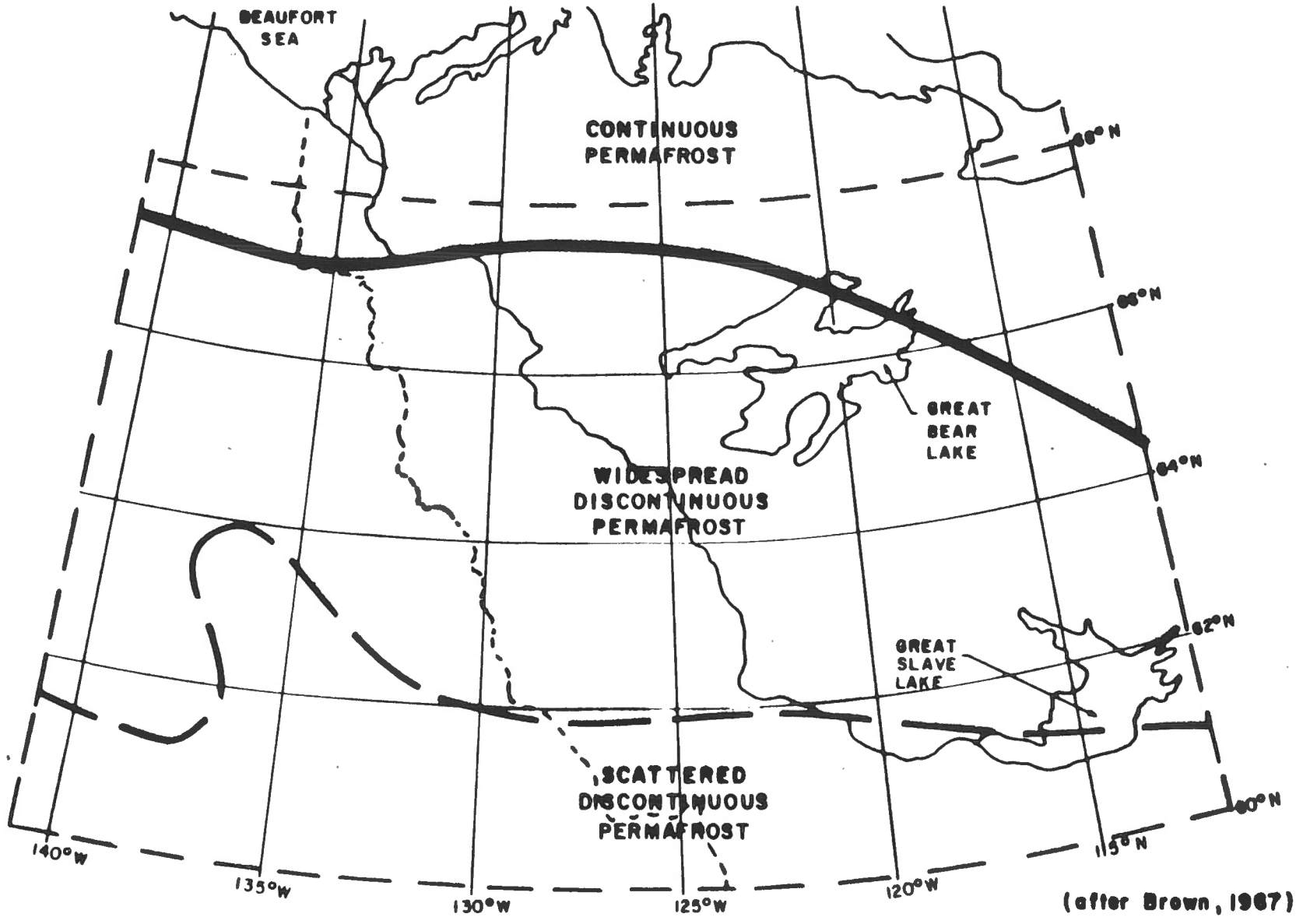
was reviewed before a preferred "pick" was selected. It may also be noted that the diagnostic criteria used in this study were developed for the Arctic Island wells and appear to be applicable to the wells reviewed in this study. They should be applicable, in theory, to permafrost/gas hydrate delineation in other areas; however, it has to be recognized that this may not necessarily be the case.

3.0 PERMAFROST THICKNESSES, WESTERN NORTHWEST TERRITORIES AND YUKON

3.1 EXISTING INFORMATION

According to the Permafrost Map of Canada (Brown, 1967), the study area is located astride the boundary between continuous and discontinuous permafrost zones. As shown on Figure 3, frozen ground is relatively continuous north of 67°N, discontinuous yet widespread between 62°N and 67°N, and scattered south of 62°N. Existing site-specific data on permafrost thicknesses are limited, and generally from widely distributed sites (frequently in or close to the Mackenzie River valley).

The early, historical, literature on permafrost occurences within the area of interest has been reviewed by Judge (1973). The first, "scientific", studies were those undertaken in the late 1940's by Hemstock, who measured ground temperature in three abandoned oil wells at Norman Wells. He showed that permafrost existed to depths of 43 m to 60 m, depending on distance from the Mackenzie River (Hemstock, 1949).



HARDY ASSOCIATES (1978) LTD.
CONSULTING ENGINEERING & PROFESSIONAL SERVICES

NORTHWEST TERRITORIES YUKON
PERMAFROST / GAS HYDRATE STUDY
PERMAFROST ZONES

C010136

FIGURE 3

HT84-82/03

Since the early 1970's, more information has become available, primarily from instrumentation of a limited number of abandoned hydrocarbon wells by the Earth Physics Branch. Data from a total of six wells in the study area (for which a reasonable suite of logs was obtainable) are now available (Table 2). Estimated permafrost thicknesses (i.e. depths, below K.B., to the $0^{o}C$ isotherm) range from 30 m + in Hume River D-53 to 445 m in Tedji Lake K-24. Frozen ground is not present in the Providence A-47 well.

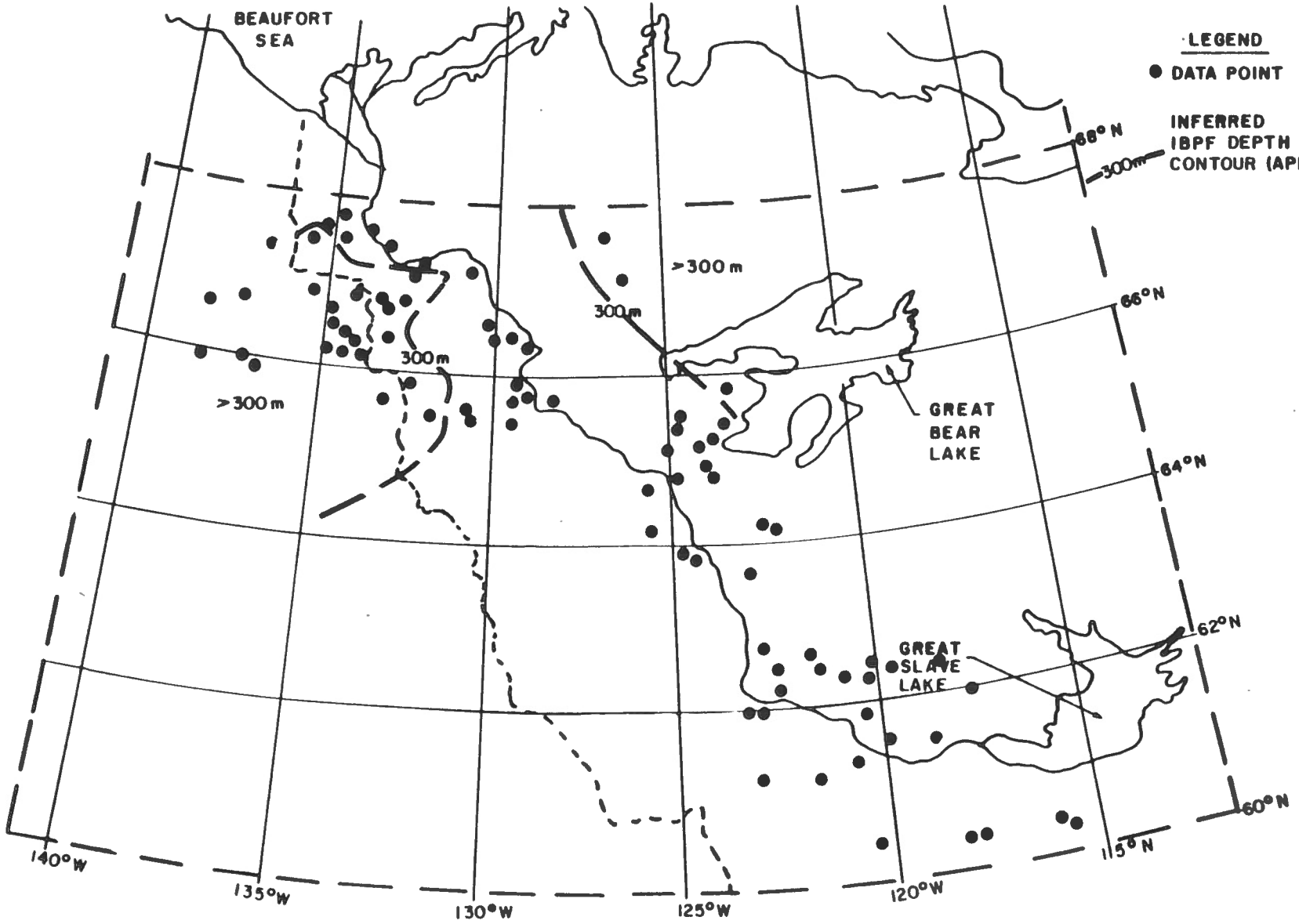
Permafrost depth interpretations have also been published for a very limited number of wells by industry. The work of Pollard and Nash (1971) is the main example. Results of previous studies are summarized, and compared with the findings of this investigation, in Section 3.3.

3.2 RESULTS OF THIS STUDY

Interpreted depths to the base of IBPF are shown, in detail, on Maps 1 to 3 (Appendix "B", Volume 2). Figure 4 provides a generalized approximation of IBPF depths and distribution; it is intended to provide an overall illustration only of trends in the results of the study. The data, presented with the related transition base depths on Table 2, are briefly discussed below.

3.2.1 $67^{o}N - 68^{o}N$

Ice-bearing permafrost is interpreted to depths ranging from 110 m to 518 m in the northernmost section of the study area, with picks not possible in nine of the 25 wells (Table 2). The thinnest IBPF is interpreted close to the Mackenzie River



HARDY ASSOCIATES (1978) LTD.
CONSULTING ENGINEERING & PROFESSIONAL SERVICES

NORTHWEST TERRITORIES YUKON
PERMAFROST / GAS HYDRATE STUDY
INTERPRETED ICE-BEARING PERMAFROST THICKNESSES

CG10136

FIGURE 4

HT84-82/03

TABLE 2

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data: 0°C Isotherm (m)*	IBPF: Base (m)	IBPF: Trans. (m)	Likely Hydrate Occurrence: Overall Interval (m)	Likely Hydrate Occurrence: Thickness (m)	Comments
1	Belot Hills M-63	-	< 198	253	-	-	
2	Molar Y.T. P-34	-	< 366	386	-	-	
3	Whitefish Y.T. I-05	-	< 262	425	-	-	Thick transition; possible relict IBPF
4	Grandview Hills No. 1	-	198	241	-	-	
5	Tree River East H-57	-	430	494	-	-	
6	Tree River F-57	-	317	387	300-1750	1450	
7	Clare F-79	-	381	472	-	-	
8	Swan Lake K-28	-	503	631	-	-	
9	Whitefish Y.T. J-70	-	< 277	-	881-927	46	
10	Manuel Lake J-42	-	326	360	631-1451	820	Scattered hydrates
11	Little Chicago N-32	-	< 185	222	-	-	
12	Colville D-45	-	< 251	-	-	-	
13	Colville E-15	-	326	-	259-1387	1128	No transition base logged
14	Nevejo M-05	-	< 253	573	-	-	Thick transition; possible relict IBPF
15	Tree River H-38	-	244	338	-	-	
16	Ridge Y.T. F-48	-	< 267	-	1411-1850	439	
17	Bell River Crown YT No. A-1	-	299	343	-	-	
18	Attoe Lake I-06	-	232	293	-	-	
19	Stony I-50	-	518	567	283-1859	1576	
20	Ft. McPherson C-78	-	189	418	96-198	102	Thick transition; relatively poor picks
21	Stopover K-44	-	< 732	-	-	-	
22	Pt. Separation No. 1	-	137	366	-	-	Low quality transition base pick
23	Stony G-06	-	110	189	30-1859	1829	
24	South Delta J-80	-	549	-	1258-1524	266	Scattered hydrates only
25	Tedji Lake K-24	E445	375	448	-	-	Scattered hydrates throughout; no detailed interpretation

* Converted to m below K.B.

X[1] Depth to 0°C isotherm, extrapolated.

E[2] Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
26	Hume R. A-53	-	415	564	872-924	52	
27	Birch Y.T. E-53	-	226	354	354-631	277	
28	Birch Y.T. B-34	-	346	405	244-1388	1144	"Ice" indications on SP below 518 m
29	E. Porcupine Y.T. I-13	-	110	210	21-1885	1864	Pollard and Nash estimate: 107 m; scattered hydrates through most of well; "ice" indications on SP from 400-1100 m
30	Weldon Creek O-65	-	399	524	524-2000+	> 1476	"Ice indications on SP down to 1320 m
31	Porcupine R. Y.T. K-56	-	704	853	-	-	
32	Whitestone Y.T. N-26	-	< 310	-	310-1865	1555	"Ice" indications on SP to 1900 m
32A	Chance Y.T. G-08	-	320	366	332-1128	796	Hydrate streaks mostly
33	E. Porcupine Y.T. F-18	-	< 244	-	-	-	Hydrate streaks throughout; no detailed interpretation
33A	Chance Y.T. No. 1	-	< 46	128	1792-2042	250	
34	Peel River Y.T. M-69	-	527	675	-	-	"Ice" indications on SP to 1800 m
35	Peel River Y.T. I-21	-	265	375	-	-	
36	N. Cath Y.T. B-63	E83	< 244	-	-	-	
37	W. Parkin Y.T. C-33	-	485	573	485-899	414	
38	Caribou Y.T. N-25	-	478	671	15-2012	1997	Scattered hydrates throughout
39	Sainville River D-08	-	360	488	-	-	
40	Ontaratue I-38	-	< 267	317	-	-	
41	Ontadek L. N-39	-	< 216	-	729-814	85	
42	Peel River Y.T. K-09	-	384	533	549-1524	975	Hydrate streaks only
43	Peel Y.T. H-71	-	-	-	829-1128	299	IBPF and transition not picked
44	N. Parkin Y.T. D-61	-	? 61	-	45-241	196	Poor IBPF pick; Pollard and Nash estimate: 152 m: "ice" indications on SP to 1500 m +
45	Porcupine Y.T. G-31	-	302	-	384-984	600	

* Converted to m below K.B.

X[1] Depth to 0°C isotherm, extrapolated.

E[2] Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data: 0°C Isotherm (m)*	IBPF: Base (m)	IBPF: Trans. (m)	Likely Hydrate Occurrence: Overall Interval (m)	Likely Hydrate Occurrence: Thickness (m)	Comments
46	Manitou Lake L-61	-	344	439	427-1722	1295	
47	S.W. Airport Creek No. 1	-	207	363	363-725	362	
48	Ontaratue H-34	-	<193	274	799-917	118	"Ice" indications on SP in shales
49	Sainville River K-63	-	308	387	186-432	246	
50	S. Tuttle Y.T. N-05	-	-	-	378-1820	1442	IBPF and transition not picked; "ice" indications on SP down to 1425 m
51	Peel River Y.T. K-76	-	293	366	293-1271	978	"Ice" indications (SP log) troughout
52	N. Circle River No. 1	-	284	369	305-473	168	
53	Circle River No. 1	-	244	369	146-808	662	
54	Peel River Y.T. J-21	-	308	399	-	-	Hydrate streaks throughout; "ice" indications (SP log)
55	Peel River Y.T. L-01	-	518	768	360-1587	1227	
56	Ellen Y.T. C-24	-	< 238	-	497-2009	1512	
57	N. Hope Y.T. N-53	-	< 464	602	729-1622	893	
58	Peel River Y.T. B-06A	-	204	250	450-1058	608	Possible "relict" IBPF between 455-521 m
59	Grandview L-26	-	658	756	307-1542	1235	
60	Trail River Y.T. H-37	-	< 162	-	-	-	No IBPF or hydrates logged
61	Peel River Y.T. H-59	-	226	280	198-597	399	
62	Shaeffer Ck Y.T. O-22	-	396	457	518-2000+	1482+	Thick deep hydrates interval
63	Arctic Red West G-55	-	<366	469	-	-	
64	Arctic Red River O-27	-	<248	412	-	-	
65	Peel River Y.T. L-19	-	320	366	229-1981	1752	Thick hydrate interval

* Converted to m below K.B.

X[1] Depth to 0°C isotherm, extrapolated.

E[2] Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
66	Arctic Red Y.T. C-60	-	436	494	66-1341	1275	
67	Martin House L-50	-	427	503	427-1238	811	
68	Satah River G-72	-	320	396	1414-1417	3	Hydrate traces only
69	Peel Y.T. F-37	-	< 335	387	-	-	
70	E. Pine Y.T. O-78	-	< 250	-	419-430	11	Possible hydrate only
71	Great Bear River N-30	-	283	323	206-600	394	
72	Dodo Canyon K-03	-	< 307	-	307-1448	1141	
73	Wolverine Creek D-61	-	415	591	317-863	546	
74	Brackett Lake C-21	-	415	588	<190-1530	1340+	Hydrates throughout; "ice" indications (SP log)
75	Norman Wells N-27X	-	350	485	214-480	266	
76	Norman Wells N-25X	-	335	480	211-480	269	
77	Norman Wells P-19X	-	400	510	245-505	60	
78	Norman Wells P-15X	-	385	470	230-492	262	
79	Bear Island No. 22	-	< 250	-	493-500	7	
80	Mackenzie River No. 1	-	330	420	175-180	5	"Ice" indications (180-450 m) on SP log
81	Norman Wells O-23X	-	390	470	235-502	267	
82	Norman Wells P-09X	-	400	490	502-512	10	Possible hydrate only
83	Goose Island (No. 20) L-57	-	433	518	216-518	302	
84	Norman Wells No. 36X	-	255	322	250-350	100	"Ice" indications to 475 m on SP log
84A	Norman Wells O-36X	-	375	495	507-516	9	Possible hydrate only
85	Norman Wells (44X) B-48	-	270	375	395-410	15	

* Converted to m below K.B.
X^1 Depth to 0°C isotherm, extrapolated.
E^2 Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
86	Norman Wells (45X) P-37	-	265	365	160-400	240	
87	Norman Wells C-37X	-	280	320	305-320	15	
88	Norman Wells B-35X	-	285	335	310-335	25	
89	Norman Wells D-42X	-	380	435	405-435	30	
90	Norman Wells D-39X	-	315	340	305-350	45	
91	Norman Wells G-30X	-	415	470	386-475	89	
92	Norman Wells G-24X	-	400	450	400-480	80	
93	Norman Wells F-23X	-	355	395	375-400	25	Possible hydrate only
94	Norman Wells B-33X	-	280	325	325-400	75	
95	Norman Wells C-38X	-	295	345	305-360	55	
96	Norman Wells K-48X	-	475	512	490-520	30	Possible hydrate only
97	Norman Wells M-13X	-	375	485	215-480	265	
98	Norman Wells N-11X	-	360	480	212-478	266	
99	Norman Wells N-23X	-	360	475	466-468	2	Possible hydrate only
100	Norman Wells N-31X	-	385	545	526-535	9	Possible hydrate only
101	Norman Wells O-10X	-	325	500	235-493	258	
102	Norman Wells O-45X	-	430	515	534-544	10	Possible hydrate only
103	Norman Wells P-11X	-	390	510	237-506	269	
104	Norman Wells P-37X	-	430	540	266-438	172	
105	Norman Wells Q-12X	-	400	490	265-488	223	

* Converted to m below K.B.
X[1] Depth to 0°C isotherm, extrapolated.
E[2] Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
106	Norman Wells Q-17-1X	-	405	500	255-510	255	
107	Norman Wells R-11X	-	405	495	208-513	305	
108	Grey Goose N-70	-	312	555	116-655	539	
109	Mahony Lake I-74	-	280	-	< 198-1015	817+	No transition logged. "Ice" indications (SP log) to 930 m
110	Russel M-07	-	256	325	< 91-223	132+	Hydrate streaks only
111	S. Ramparts I-77	-	299	402	610-1587	977	
112	Oscar Creek J-48	-	195	277	-	-	
113	Hume River L-09	-	323	378	322-1655	1333	
114	Oscar Creek H-71	-	259	290	91-222	131	
115	A-1 Cranswick A-22	-	405	594	15-1548	1533	"Ice" indications to 1082 m on SP
116	W. Whitefish River H-34	E108	299	424	< 183-1576	1393+	
117	White M-04	-	207	238	< 102-463	361+	Scattered hydrates, streaks only
118	Carcajou L-24	-	308	381	439-671	232	
119	S. Maida Creek G-56	-	232	274	271-277	6	Hydrate traces only
120	Maida Creek F-57	-	294	448	-	-	
121	Whitefish River K-76	-	< 209	-	209-1134	925	Scattered hydrates
122	Arctic Red F-47	-	323	382	302-2000	1698	
123	Carcajou J-27	-	625	771	611-686	75	
124	Carcajou K-68	-	564	597	881-913	32	Hydrate traces only
125	Lost Hill Lake F-62	-	213	320	183-1283	1100	

* Converted to m below K.B.
X^1 Depth to 0°C isotherm, extrapolated.
E^2 Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
126	Cranswick Y.T. A-42	-	183	213	-	-	
127	Mountain R. A-23	-	< 156	-	156-399	143	"Ice" indications (SP log) to 427 m
128	Hanna River J-05	-	< 155	-	-	-	
129	Mountain River H-47	-	546	591	-	-	
130	Blackstone Y.T. D-77	-	-	-	360-2012+	> 1652	"Ice" indications on SP to 1134 m
131	Mallard Y.T. O-18	-	303	-	303-1402	1099	
132	Shoals C-31	-	210	290	-	-	
133	Losh Lake G-22	-	372	412	-	-	
134	Hume River D-53	30+	390	472	-	-	
135	Hume R. O-62	-	216	290	-	-	
136	Alder Y.T. C-33	-	299	393	332-348	16	Hydrate traces only
137	S. Chance Y.T. D-63	-	570	610	834-1320	486	
138	South Peel D-64	-	351	421	684-1740	1056	Scattered hydrates between 684-1067'
139	Beavertail G-26	-	156	216	108-1487	1379	
140	Taylor Lake Y.T. K-15	-	625	853	515-1920	1405	Thick transition; scattered hydrates
141	Blackfly Y.T. M-55	-	< 515	-	637-1445	808	"Ice" indications to 1737 m on SP
142	Whitestone Y.T. N-58	-	500	646	291-1558	1267	
143	Blackie No. 1 Y.T. M-59	-	640	893	579-2000+	1421+	Thick transition; scattered hydrates
144	Blackwater Lake G-52	-	< 213	-	349-899	550	
145	Keele S. A-28	-	< 311	381	1180-1643	463	
146	Redstone P-78	-	290	460	250-1174	924	
147	Red Dog K-29	-	159	-	564-1512	948	Possible "relict" IBPF at 259-408 m
148	Keller Lake O-13	-	280	344	168-695	527	
149	Keller Lake P-14	-	183	235	< 130-480+	> 350	
150	Stewart B-30	-	415	512	360-1082	722	SP log suggests "ice" to 1082 m

* Converted to m below K.B.
X[1] Depth to 0°C isotherm, extrapolated.
E[2] Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
151	Keele River I-01	-	227	341	427-503	76	
152	Keele River L-04	-	399	433	698-1167	469	
153	Tate J-65	-	312	-	509-2015	1506	Scattered hydrates throughout
154	Blackwater Lake I-54	-	302	-	451-933	482	
155	Little Bear I-70	-	230	-	230-1009	779	
156	East Mackay B-45	-	268	387	1216-1609	393	
157	Police Island L-66	-	< 203	284	305-1299	994	
158	Old Fort Point E-30	-	241	277	162-643	481	
159	St. Charles Creek H-61	-	216	285	283-616	333	
160	Bluefish K-71	-	418	463	479-838	359	
161	Ft. Norman K-14	-	216	271	104-704	600	Hydrate streaks only: 274-677 m
162	Slater River A-37	-	< 129	-	190-847	657	
163	Fish Lake G-60	-	? 372	424	< 186-686	> 500	Poor IBPF and base transition picks
164	Wrigley G-70	-	381	-	< 194-1311	> 1117	"Ice" indications on SP to 1204 m
165	Cartridge F-72	-	94	-	< 94-625	> 531	Pollard and Nash estimate: 168-180 m
166	Ochre River P-15	-	< 210	-	< 210-229	19+	
167	Johnson A-12	-	463	543	503-777	274	
168	Lac Tache C-35	-	< 57	104	95-287	192	
169	Blackwater E-11	-	335	402	< 240-1661	142	Possible hydrates only
170	Plateau G-51	-	250	341	640-930	590	Possible hydrates only
171	Dahadinni M-43A	E48	284	357	184-1271	1087	
172	Dahadinni D-65	-	341	411	268-1530	1262	
173	Cloverleaf I-46	-	369	463	338-1923	1585	
174	Keller Lake F-49	-	< 127	-	-	-	
175	Trail River P-13	-	302	317	683-762	79	Possible hydrates only

* Converted to m below K.B.
X[1] Depth to 0°C isotherm, extrapolated.
E[2] Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
176	Cli Lake G-15	-	290	439	1475-1722	247	
177	Cli Lake K-54	-	284	427	-	-	
178	Willow Lake L-59	-	235	253	-	-	
179	Davidson Creek P-02	-	244	290	101-783	682	
180	Willow Lake B-20	-	297	363	208-847	639	
181	Willow Lake O-27-A	-	277	396	366-814	448	
182	Ebbutt D-50	-	171	271	689-701	12	Possible hydrates only
183	Ebbutt J-70	-	158	259	247-803	606	Possible hydrates only
184	Harris River F-71	-	277	393	341-533	192	Possible hydrates only
185	Willow Lake G-32	-	204	290	372-796	424	Possible hydrates only
186	Ebbutt G-72	-	< 133	171	933-1137	204	Poor quality hydrate picks
187	Berry Island A-42	-	253	299	393-1820	1427	Poor quality IBPF and hydrate picks
188	Hornell Lake G-24	-	338	387	241-430	189	Poor quality IBPF and hydrate picks
189	Levis D-76	-	116	210	232-311	79	Poor quality IBPF and hydrate picks
190	Ebbutt J-05	-	226	323	154-338	184	Hydrate streaks only
191	Harris River A-31	-	134	168	216-599	383	Possible hydrates only
192	Berry F-71	-	244	305	375-1183	808	Poor quality picks
193	Highland Lake K-42	-	283	442	206-283	77	Poor quality picks
194	Highland Lake I-23	-	248	323	154-728	574	Poor quality picks
195	Willowlake G-47	-	274	372	1121-1143	22	Possible hydrate only

* Converted to m below K.B.
X^1 Depth to 0°C isotherm, extrapolated.
E^2 Depth to 0°C, isotherm, based on logarithmic return equation.

SUMMARY OF RESULTS

Well Number	Well Name	EPB Data 0°C Isotherm (m)*	IBPF Base (m)	IBPF Trans. (m)	Likely Hydrate Occurrence Overall Interval (m)	Likely Hydrate Occurrence Thickness (m)	Comments
196	Root River I-60	-	< 305	? 426	634-640	6	Possible hydrate only
197	Willowlake R. I-71	-	166	183	96-131	35	Good hydrate pick
198	Willow A-39	-	< 171	-	171-652	481	
199	Willowlake H-10	-	? 244	-	222-311	89	Poor IBPF pick (no SP)
200	Windflower G-77	-	158	207	-	-	No sonic
201	Blackstone E-72	-	256	311	411-472	61	Poor picks
202	Grainger C-42	-	177	236	-	-	
203	Simpson D-25	-	< 177	-	-	-	
204	Jean Marie N-73	-	256	457	746-783	37	Thick transition
205	Providence A-47	0	< 71	-	-	-	No permafrost interpreted by EPB
206	Mills Lake P-52	-	< 76	-	76-710	34	
207	Mills Lake C-03	-	183	290	-	-	
208	Trout R. D-66	-	140	192	-	-	
209	Trainor Lake G-07	-	< 192	-	192-207	15	
210	Trout Lake M-51	-	338	403	405-496	91	Poor picks
211	Pointed Mountain G-62	-	< 940	-	-	-	
212	Grumbler I-72	-	158	274	168-265	97	
213	N. Tathlina I-72	-	174	274	484-629	135	Very poor picks
214	Alexandra O-54	-	216	250	-	-	
215	Celibeta D-66	-	< 280	-	311-769	458	
216	Grumbler F-07	-	183	256	73-88	15	
217	Trainor L-59	-	< 335	-	-	-	Poor picks

CG-10136

5/78

* Converted to m below K.B.

X[1] Depth to 0°C isotherm, extrapolated.

E[2] Depth to 0°C, isotherm, based on logarithmic return equation.

while log tops are generally too deep to provide good data on conditions in the Eagle Plains area. Transition base depths range from 189 to 631 m. In general, the reliability of the picks is rated only fair to poor.

3.2.2 66°N - 67°N

Interpreted permafrost conditions vary widely in wells that are located between 66°N and 67°N. As shown on Table 2 and Map 3, IBPF depths range from 110 to 704 m, with corresponding transition base depth ranging from 61 to 853 m (transitions were not logged in a number of instances). Again, the overall reliability of IBPF and transition base picks is only fair to poor.

Of some interest is the apparent occurence in a number of wells (primarily in the vicinity of the Peel River, in the unglaciated part of the Yukon) of "ice" indications (on the SP log) down to considerable depth. In some instances, the "ice" apparently corresponds to hydrate interpreted on the sonic log, in others it does not. The Analysis Detail sheets and side-by-side log presentations provide details.

3.2.3 65°N - 66°N

In all, logs for some 72 wells were interpreted within this section of the study area; of these, 32 are within the immediate Norman Wells area.

For the latitude interval as a whole, IBPF and transition base depths range from 155 to 640 m and 216 to 893 m, respectively (Table 2). As a generalization, the thick permafrost depths

are interpreted in the Yukon (Figure 4). Permafrost picks are generally assigned a fair to poor reliability rating.

Ice-bearing permafrost is consistently picked (though with relatively low reliability) at depths in the 225 to 475 m range in the Norman Wells area (Wells 75-107, Table 2). Transitions extending to depths of 312 to 545 m are interpreted (again relatively consistently). In light of existing knowledge (E.P.B. and other sources) of permafrost depths and distribution at this location, however, it is our view that these interpretations are somewhat suspect (see Section 3.3). This is confirmed, to an extent, by the poor reliability ratings assigned to the majority of picks (see Analysis Details).

3.2.4 $64^{o}N - 65^{o}N$

Logs for some 19 wells between latitudes $64^{o}N$ and $65^{o}N$ were reviewed, and IBPF depths ranging to 418 m (transition to 463 m) interpreted (Table 2). In the case of seven wells, permafrost is interpreted to be above the resistivity log tops (i.e. less than 129 to 312 m).

3.2.5 $63^{o}N - 64^{o}N$

In the 12 wells within this part of the study area, IBPF is interpreted to depths ranging from 57 to 463 m (Table 2). At five of the sites, picks could not be made. Transitions extending to depths of up to 543 m are interpreted; in three instances, no transition base could be picked. Generally, the reliability of the permafrost picks is rated as fairly poor

and, on the basis of existing knowledge of permafrost distribution, is considered to be suspect.

3.2.6 $62^{o}N - 63^{o}N$

Logs for a total of 26 wells were reviwed. Interpreted IBPF and transition depths range from 133 to 338 m and 168 to 426 m, respectively (Table 2). In general, the IBPF and transition base picks are assigned a relatively poor reliability rating.

3.2.7 $60^{o}N - 62^{o}N$

In seven of the 17 wells reviewed, permafrost picks could not be made (likely due to the absence of frozen ground). Depths of IBPF and transition base ranging up to 338 and 457 m, respectively, were interpreted in the remaining wells. As a generalization, the reliability of most picks is poor to very poor and the thick permafrost interpretations may be suspect.

3.3 COMPARISON WITH PREVIOUS INTERPRETATIONS

A limited number of previously-published interpretations of permafrost conditions are available, in addition to the results of precise temperature surveys by the E.P.B. This section of the report compares pertinent previous results with the interpretations developed in this study.

3.3.1 Earth Physics Branch

Permafrost thickness determinations, based on precise ground temperature surveys, have been published relative to only six

wells for which adequate log coverage was available (logs were either not run or could not be located for the seven wells instrumented by the E.P.B. in the Norman Wells area). Results of the E.P.B. surveys and estimated frozen ground thicknesses are contained in the Canadian Geothermal Data Collection - Northern Wells (Taylor and Judge, 1971, 1974, 1975, 1976; Judge et al, 1979, 1981; Taylor et al, 1982).

For purposes of comparison, the E.P.B. permafrost depth estimates for all instrumented sites (whether reviewed in this study or not) provide a valuable gauge of the accuracy of the results presented here. A review of the two data sets suggests the following:

i) For the wells that were interpreted in detail, reasonable agreement exists for the two northernmost (Tedji Lake and N. Cath.) and southernmost (Providence) wells. Correspondence is poor in the remaining three wells.

ii) For wells in the general vicinity of other E.P.B. instrumented holes (for which logs were not available), the same relation seems to hold (i.e. good agreement in the north and south, relatively poor elsewhere).

iii) Interpretations for Norman Wells sites are not entirely inconsistent with E.P.B. estimates; however, based on data presented by Judge (1973, 1975), the interpreted IBPF depths appear to be overly deep.

3.3.2 Hemstock (1949)

In this pioneer study, Hemstock reported frozen ground thicknesses in three wells (Imp Canol 15X, 17X and 33X) ranging from 43 to 60 m. These results are in agreement with more recent ground temperature measurements at Norman Wells (Judge, 1973).

A wide, though apparently relatively consistent, discrepancy exists between the existing, petrophysically-based, interpretations shown on Table 2 (albeit of poor to very poor reliability) and those based on temperature surveys. The nature of the discrepancy is not presently entirely clear; however, it is our assessment that permafrost at Norman Wells may exist within "casing depth", and that the picks are a reflection of some features(s) other than permafrost.

3.3.3 Pollard and Nash (1971)

These authors provide interpretations of permafrost conditions in three wells: E. Porcupine Y.T. I-13, N. Parkin Y.T. D-61 and Cartridge F-72 (Pollard and Nash, 1971; Figures 15-17), based on petrophysical log criteria. As shown on Table 2, a good correlation exists for the E. Porcupine well. At the other two sites however, the permafrost frost depths interpreted are considerably less than those published by Pollard and Nash.

3.4 SUMMARY

Depths to the base of IBPF have been interpreted for 172 of the 220 wells considered in this study. Ice-bearing perma-

frost is interpreted to range from 61 m to over 600 m thick (Maps 1 to 3, Table 2).

An attempt to contour the results, to provide an appreciation of overall trends within the data, is presented on Figure 4. In general, relatively thick IBPF is interpreted (300 m) in the northwestern section of the study area and the north of Great Bear Lake. Elsewhere, interpreted thicknesses are very variable, generally increasing away from the Mackenzie valley and contouring was not practical.

Agreement with previous interpretations and study results is variable. As a generalization, interpretations for wells in the northern and southernmost sections of the study area compare reasonably well, while in the Norman Wells area and further south agreement appears to be only poor to very poor.

4.0 GAS HYDRATE OCCURENCES, WESTERN NORTHWEST TERRITORIES AND YUKON

4.1 EXISTING INFORMATION

Natural gas hydrates were first documented in the Canadian Arctic by Bily and Dick (1974), although their likely occurence had earlier been suggested by Pollard and Nash (1971). Aside from describing their presence in a number of Mackenzie Delta wells, Bily and Dick also noted that temperature-pressure conditions favoured their occurence in parts of the Norman Wells oil reservoir.

The available (very limited) published data have recently been reviewed by Davidson et al (1978) and Judge (1982). Their

common conclusion, based on reviewing known ground temperatures and geothermal gradients relative to hydrate stability curves, was that hydrates were likely absent from the Mackenzie Valley and Yukon.

4.2 RESULTS OF THIS STUDY

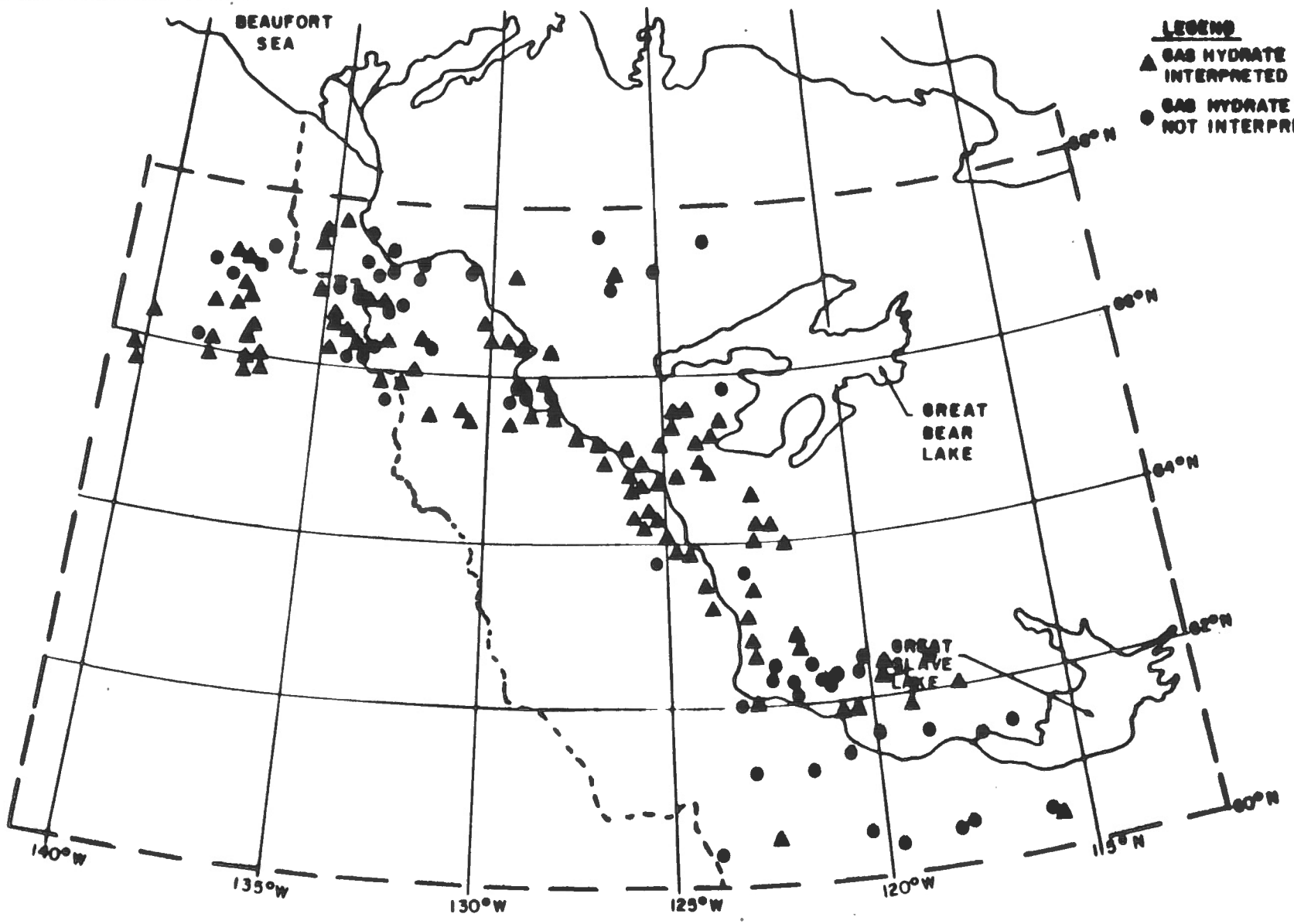
Objectives in the sections that follow are to describe the interpreted distribution of natural gas hydrates. Maximum encountered depths and thicknesses within each section of the study areas are summarized below. The basic data are presented in detail on the Analysis Details in Appendix "A", summarized on Table 2 and plotted on Maps 1 to 3. Figure 5 illustrates the overall distribution of interpreted hydrate occurences and non-occurences.

4.2.1 $67^{o}N - 68^{o}N$

The presence of natural gas hydrates is interpreted within only 10 of the 25 wells reviewed in this northernmost section of the study area (Maps 2 and 3). In the remaining wells, hydrates are interpreted to extend to depths of up to 1859 m, and occur within overall hydrate-bearing zones from 46 to 1829 m thick (Table 2).

4.2.2 $66^{o}N - 67^{o}N$

Hydrates are interpreted to be somewhat more prevalent between latitudes $66^{o}N$ and $67^{o}N$, occuring in 39 of 49 wells (Maps 2 and 3). As shown on Table 2, however, only hydrate traces and streaks are interpreted in a number of instances and the hydrate-bearing interval is very thin. Overall, hydrates are



HARDY ASSOCIATES (1978) LTD.
CONSULTING ENGINEERING & PROFESSIONAL SERVICES

NORTHWEST TERRITORIES YUKON PERMAFROST / GAS HYDRATE STUDY INTERPRETED GAS HYDRATE OCCURENCE

CG10136

FIGURE 1

HT84 82/03

interpreted from less than 50 m to depths of as much as 2000 m ± (Table 2).

4.2.3 $65^{\circ}N - 66^{\circ}N$

Gas hydrates are interpreted in nearly all the Norman Wells area wells. They also apparently exist in many of the other wells within this latitude interval.

At Norman Wells, thin hydrates are interpreted within two main zones: immediately below casing and just above the oil reservoir horizon. Overall, the hydrate-bearing interval extends from about 200 m to 500 m (Table 2).

Away from the vicinity of Norman Wells, hydrates are interpreted to depths of as much as 2000 m. Thicknesses of the interpreted hydrate-bearing intervals range up to over 1600 m (Table 2).

4.2.4 $64^{\circ}N - 65^{\circ}N$

Within this latitude interval, natural gas hydrates are interpreted to exist in all 19 wells that were reviewed as part of this study (Table 2). Maximum interpreted depth of occurence and hydrate-bearing zone thickness are over 1600 m and 1500 m+, respectively.

4.2.5 $63^{\circ}N - 64^{\circ}N$

Hydrate occurence is interpreted to be extensive between latitudes 63° and $64^{\circ}N$ (Table 2). Overall hydrate-bearing

intervals up to 1600 m thick are interpreted in places, extending to depths in excess of 1900 m.

4.2.6 $62^{\circ}N - 63^{\circ}N$

As shown on Table 2, hydrates are interpreted to occur in most wells; however, the hydrate picks are of poor quality. Hydrates apparently exist only as streaks and traces in a number of instances. Maximum interpreted depth of hydrate occurence is nearly 1200 m, with overall hydrate-bearing intervals of up to 1400 m thick.

4.2.7 $60^{\circ}N - 62^{\circ}N$

Between $60^{\circ}N$ and $62^{\circ}N$, hydrates are interpreted to be either absent or thin and sparsely distributed (Table 2).

4.3 COMPARISON WITH PREVIOUS INTERPRETATIONS

As noted in Section 4.1, existing information on likely hydrate occurence within the western Northwest Territories and Yukon is very limited. Davidson et al (1978) and Judge (1982), for example, both conclude (based on data from only six wells) that hydrates are "not present in the Mackenzie Valley and Yukon". Geothermal gradient data presented by tti GEOTECHnical resources ltd. (1984), suggesting that suitable conditions for hydrate occurence may exist in the Yukon and north of Great Bear Lake, possibly exist within the Mackenzie River valley, and likely do not exist in the southern section, are the only other available data on hydrate occurence.

As shown on Maps 1 to 3 and Figure 5, hydrates are interpreted to exist throughout much of the study area. Their inferred distribution is in fair agreement with that suggested by the geothermal gradient data, but at variance with existing published interpretations.

As a generalization, hydrates are apparently most abundant (in terms of maximum depth of occurence and thickness of interpreted hydrate-bearing interval) in the Yukon portion of the study area (Figure 5). They seem to be very sparsely distributed south of latitude 62°N.

Comparison with previously published interpretations is poor. However, reasonable agreement does exist with the distribution inferred based on unpublished geothermal gradient data.

5.0 DISCUSSION

Results of a study of permafrost conditions and gas hydrate occurence in 220 wells, located in the western Northwest Territories and Yukon, are described. Wells were selected for detailed interpretation based on anticipated permafrost and gas hydrate occurence and log availability.

Ice-bearing permafrost is interpreted in some 172 of the 220 wells examined; it is logged to depths ranging from 61 to greater than 600 m. In the remaining wells, either the availability of logs did not permit a definitive IBPF or transition base pick to be made, or (in a very limited number of wells) a pick could not be made. Comparison with previous interpretations suggests good agreement in the northern (relatively thick permafrost) areas and in the south (where

permafrost is not present). Elsewhere, between about latitudes 62°N and 66°N, agreement does not appear to be very good.

Natural gas hydrates are interpreted, with fair or good reliability in a total of 132 wells. Of the remaining wells, hydrates appear to be absent in 45 and to (possibly) occur as thin streaks only in 43. Hydrates appear to be considerably more prevalent than previously thought (on the basis of very limited information).

A number of areas for potential future work have been identified, arising out of the study (and the previous Arctic Islands study). Most of these relate to additional petrophysical studies:

i) Detailed analysis of the deep "ice" indications noted (on SP logs) in wells from the Peel River area of the Yukon.

ii) Estimation of ice contents in IBPF, based primarily on analysis of resistivity and sonic logs,

iii) Determination of hydrocarbon saturation in hydrates, based on petrophysical analysis,

iv) Analysis of mud gas logs, relative to various sources of gas, such as hydrates, dissolved gas in water sand,

dry gas accumulations, gas associated with oil accumulations.

Respectfully submitted,

PETROPHYSICAL CONSULTANTS INTERNATIONAL LTD.

Per:
G.E. Dawson-Grove, P.Eng., P.Geol.

HARDY ASSOCIATES (1978) LTD.

Per:
N.G. Mosley, M.Sc., P.Geol.

Per:
I. Jones, M.Sc., P.Geol.

IJ/mm
5/449

REFERENCES

Bily, C and J.W.L. Dick, 1974. Naturally occuring Gas Hydrates in the Mackenzie Delta, N.W.T. Bull. Can. Petrol. Geol., 22, 340-352.

Brown, R.J.E., 1967. Permafrost in Canada. Nat. Res. Council, Div. Building Res., NRC 9769, and Geol. Surv. Can., Map 1246A.

Collett, T.S., 1983. Detection and Evaluation of Natural Gas Hydrates from Well Logs, Prudhoe Bay, Alaska. Proc. 4th Int. Conf. Permafrost, Fairbanks, Alaska, 169-174.

Davidson, D.W., El-Defrawy, M.K., Fuglem, M.O. and A.S. Judge, 1978. Natural Gas Hydrates in Northern Canada. Proc. 3rd Int. Conf. Permafrost, 1, 937-943.

Desai, KP. and E.J. Moore, 1968. Well log interpretation in permafrost. The Log Analyst. January-February, 13-25.

D.I.A.N.D., 1980. Schedule of Wells: Northwest Territories and Yukon Territories (1920-1979, with amendments).

D & S Petrophysical Consultants, 1983. A study of well-logs in the Mackenzie Delta/Beafort Sea to outline permafrost and gas hydrate occurence. EPB Open File # 83-10, E.M.R.

Hardy Associates (1978) Ltd., 1984. A study of well-logs in the Arctic Islands to outline permafrost and gas hydrate occurence. Unpublished report to Earth Physics Br., E.M.R., 43 p.

Hemstock, R.A., 1949. Permafrost at Norman Wells. Imperial Oil Ltd., Calgary, 100 p.

Hood, G., 1980. A review of oil industry experience with gas hydrates in exploratory drilling in the Canadian Arctic. in Proc. Symp. Permafrost Geophys. Assoc. Comm. Geotech. Res. Tech. Memo 128, NRC Canada, pp 159-162.

Hnatiuk, J. and A.G. Randall, 1977. Determination of permafrost thickness in wells in northern Canada. Can. J. Earth Sci. 14, 375-383.

Judge, A.S., 1973. Thermal regime of the Mackenzie Valley: observations of the natural state. Environmental-Social Committee, Northern Pipelines, Rept. 73-38, 177 p.

Judge, A.S., 1982. Natural gas hydrates in Canada in Proc. 4th Canadian Permafrost Conf., 320-328.

Judge, A.S., Taylor, A.E. and M. Burgess, 1979. Canadian Geothermal Data Collection-Northern Wells, 1977-78. Geothermal Series Number 11, Earth Physics Br., EMR, 187 p.

Judge, A.S. Taylor, A.E., Burgess, M. and V.S. Allen, 1981. Canadian Geothermal Data Collection Northern Wells, 1978-80. Geothermal Series Number 12, Earth Physics Br., EMR, 190 p.

Osterkamp, T.E. and M.W. Payne, 1981. Estimates of permafrost thickness from well logs in northern Alaska. Cold Regions Science and Technology, 5, 13-27.

Pollard, D.E. and R.G. Nash, 1971. Observations on permafrost logging in the Canadian Arctic. Can. Soc. Well Logging J. 4, 37-84.

Taylor, A.E. and A.S. Judge, 1974. Canadian Geothermal Data Collection - Northern Wells, 1955 to February 1974. Geothermal Series Number 1, Earth Physics Br., EMR, 171 p.

Taylor, A.E. and A.S. Judge, 1975. Canadian Geothermal Data Collection - Northern Wells, 1974. Geothermal Series Number 3, Earth Physics Br., EMR, 127 p.

Taylor A.E. and A.S. Judge, 1976. Canadian Geothermal Data Collection - Northern Wells, 1975. Geothermal Series Number 6, Earth Physics Br., EMR, 142 p.

Taylor, A.E. and A.S. Judge, 1977. Canadian Geothermal Data Collection - Northern Wells, 1976-77. Geothermal Series Number 10, Earth Physics Br., EMR, 194 p.

Taylor, A.E. M.Burgess, A.S. Judge and V.S. Allen, 1982. Canadian Geothermal Data Collection - Northern Wells 1981. Geothermal Series Number 13 Earth Physics, EMR, 153 pp.

tti GEOTECHNICAL resources ltd., 1984. Subsurface temperature data from wells North of Sixty, Yukon-Northwest Territories. Unpublished report to Earth Physics Br., E.M.R., 64 p.

Walker, J.D. and A.J. Stuart, 1976. Permafrost investigations by crystal cable surveys, Mackenzie Delta, N.W.T. Trans. SPWLA, 17th Ann. Logging Symp.

APPENDIX "A"

Analysis Details

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 1
D.A. No.: 567
E.P.B. No.: -

NAME: Mobil Belot Hills M-63

K.B.: 460.7 m G.L.: 457.5 m T.D.: 1283.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	I-EL-GR, LL	650	4204	<650	830	3			
Long-spaced Res.	-								
Sonic (Acoustic)	AC GR	0	4204				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	DEN	650	3246						
Neutron	SNP	650	4207						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 2
D.A. No.: 138
E.P.B. No.: -

NAME: Socony Mobil - W.M. Molar Y.T. P-34

K.B.: 803.5 m G.L.: 799.2 m T.D.: 2653.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	INDE, ML-C	1201	6600	< 1201	1266	3			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	50	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	TEMP	300	3725	1470					
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.
Temperature gradient change at ±1470 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 3 NAME: Chevron SOBC WM Whitefish Y.T. I-05
D.A. No.: 578
E.P.B. No.: -

K.B.: 348.1 m G.L.: 342.3 m T.D.: 1498.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DIL	859	4902	<859	1395	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	100	4906				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1500	4905						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.
Apparent very thick transition; possible relict IBPF.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 4
D.A. No.: -
E.P.B. No.: -

NAME: Richfield Oil Corp et al Grandview Hills No. 1

K.B.: 369.7 m G.L.: 366.0 m T.D.: 1998.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	EL, IND E	598	6503	650	790	3			
Long-spaced Res.	-								
Sonic (Acoustic)	AC	580	6361				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	100	6500						
Caliper	x								
Density	-								
Neutron	x								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 5 ' ' '
D.A. No.: 339
E.P.B. No.: -

NAME: Shell Tree River East H-57

K.B.: 108.3 m

G.L.: 103.3 m

T.D.: 1982.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	1002	6493	1410	1620	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1002	6495				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1002	6495						
Neutron	SNP	1002	6490						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 6
D.A. No.: 454
E.P.B. No.: -

NAME: Shell Tree River F-57

K.B.: 104.9 m

G.L.: 100.6 m

T.D.: 1979.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	608	6488	1040	1270	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	808	6490				985	5740	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	191	6491						
Neutron	SNP	808	6490						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
985	1000	3	4020	4260	3
2140	2160	3	5440	5740	3
3670	3880	3			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 7 ' ' '
D.A. No.: 154
E.P.B. No.: -

NAME: IOE Clare F-79

K.B.: 108.8 m

G.L.: 104.5 m

T.D.: 2527.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	841	6600	1250	1550	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	841	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	TEMP	50	6600	750					
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

Change in TEMP gradient at about 750 ft.
No hydrates logged.
Evidence of thawed zone at 1250 - 1350 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 8
D.A. No.: 256
E.P.B. No.: -

NAME: IOE Swan Lake K-28

K.B.: 87.9 m

G.L.: 85.0 m

T.D.: 1838.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IES, ML-C	619	6032	1650	2070	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	619	6031				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 9
D.A. No.: 646
E.P.B. No.: -

NAME: Chevron SOBC WM Whitefish Y.T. J-70

K.B.: 330.7 m G.L.: 326.1 m T.D.: 2127.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DIL	908	6975	<908	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	AC GR	10	6974				2890	3040	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2890	2950	3 (scattered)
3000	3040	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 10
D.A. No.: 479
E.P.B. No.: -

NAME: Mobil Inexco NCO Sun Manuel Lake J-42

K.B.: 325.7 m G.L.: 320.2 m T.D.: 2046.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	698	6696	1070	1181	3			
Long-spaced Res.	-								
Sonic (Acoustic)	AC GR	0	6688				2070	4760	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2070	2850	3 (scattered)
3060	3170	3
3550	4760	3 (scattered)

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 11
D.A. No.: 235
E.P.B. No.: -

NAME: Atlantic Little Chicago N-32

K.B.: 89.0 m
G.L.: 85.4 m
T.D.: 1958.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	LL	606	6415	<606	730	3			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	606	6411				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	F DEN	605	6418						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.
IBPF above RES log top.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 12
D.A. No.: 685
E.P.B. No.: -

NAME: Union Mobil Colville D-45

K.B.: 639.8 m G.L.: 634.4 m T.D.: 1174.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	2706	3852	<2706	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	AC GR	2706	3845				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRC	20	3853						
Caliper	x								
Density	x								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above Res log top.
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 13 NAME: Mobil Colville E-15
D.A. No.: 438
E.P.B. No.: -

K.B.: 386.8 m G.L.: 382.5 m T.D.: 1827.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	EL, IND E	515	4548	1070	-	3			
Long-spaced Res.	-								
Sonic (Acoustic)	S	515	4550				850	4550	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	34	5982						
Caliper	x								
Density	-								
Neutron	x								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
850	1350	3
3550	4400	3
4480	4550	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 14 NAME: IOE Nevejo M-05
D.A. No.: 212
E.P.B. No.: -

K.B.: 74.4 m G.L.: 70.4 m T.D.: 2380.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	INDE, ML-C	830	6600	<830	1880	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	50	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.
Thick transition; possible relict IBPF

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 15 NAME: IOE Tree River H-38
D.A. No.: 260
E.P.B. No.: -

K.B.: 79.6 m G.L.: 75.3 m T.D.: 1279.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	622	4200	800	1110	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	4199				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 16
D.A. No.: 628
E.P.B. No.: -

NAME: Chevron SOBC Gulf Ridge Y.T. F-48

K.B.: 321.3 m G.L.: 315.2 m T.D.: 1868.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DIL	882	6120	<882	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	AC GR	50	6132				4630	6070	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	DEN	882	6120						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
4630	5250	3
5870	6070	3

D. COMMENTS

IBPF above RES log top.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 17
D.A. No.: 83
E.P.B. No.: -

NAME: Amerada et al Bell River Y.T. A-1

K.B.: 317.6 m
G.L.: 313.0 m
T.D.: 2439.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	E LOG, ML-C	152	6600	980	1125	3			
Long-spaced Res.	-								
Sonic (Acoustic)	-						-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	-								
Caliper	x								
Density	-								
Neutron	-								
Temperature	TEMP	50	2500	780					
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged; no sonic.
Temp profile gradient change at 780 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 18
D.A. No.: 375
E.P.B. No.: -

NAME: INC NCO Mobil Attoe Lake I-06

K.B.: 86.2 m G.L.: 83.2 m T.D.: 2257.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	34	6600	760	960	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	100	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	100	6600						
Caliper	x								
Density	-								
Neutron	x								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 19 NAME: IOE Stony I-50
D.A. No.: 206
E.P.B. No.: -

K.B.: 322.0 m G.L.: 317.3 m T.D.: 3343.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	INDE, ML-C	893	6600	1700	1860	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	893	6600				930	6100	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
930	1960	2	4800	4850	2
2500	3380	2-3 (scattered)	4890	5130	3 (scattered)
4280	4450	2	5670	6100	3 (scattered)

D. COMMENTS

Evidence of thawing in IBPF (on RES log).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 20 NAME: Shelly-Getty Amoco Ft. McPherson C-78
D.A. No.: 586
E.P.B. No.: -

K.B.: 19.8 m G.L.: 15.8 m T.D.: 3068.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	1201	6600	600	1370	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	322	6600				320	650	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1201	6600						
Neutron	SNP	1201	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
320	495	3	620	650	2
495	510	1			
510	620	3			

D. COMMENTS

Thick transition.
,IBPF picked from sonic.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 21
D.A. No.: 784
E.P.B. No.: -

NAME: Union Imp Stopover K-44

K.B.: 367.2 m G.L.: 363.5 m T.D.: 943.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	2439	3088	<2439	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	2439	3058				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	10	1458						
Caliper	x								
Density	FD	2438	3091						
Neutron	CN	2438	3091						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above RES log top (2439 ft).
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 22
D.A. No.: 83
E.P.B. No.: -

NAME: Richfield et al Pt. Separation No. 1

K.B.: 18.9 m | G.L.: 15.2 m | T.D.: 2445.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	E LOG	96	6600	450	1200	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	ACOUSTIC	984	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	40	6600						
Caliper	x								
Density	-								
Neutron	x								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.
Poor transition base pick.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 23
D.A. No.: 624
E.P.B. No.: -

NAME: Dome Union IOE Stony G-06

K.B.: 56.7 m G.L.: 51.8 m T.D.: 2531.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	66	6600	360	620	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	20	6600				100	6100	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	5600	6600						
Neutron	SNP	5600	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
100	900	2	2780	2900	2	5230	5240	1
900	1450	3 (scattered)	3050	4300	3 (scattered)	5630	5700	3
1740	1810	3	4650	4750	3	5700	5850	3
1860	1920	2	5100	5140	3	5920	6100	3 (scattered)

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 24
D.A. No.: 603
E.P.B. No.: -

NAME: Bluemount et al Gulf South Delta J-80

K.B.: 12.3 m G.L.: 11.3 m T.D.: 2897.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	441	6600	1800	-	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	441	6600				4130	5000	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	1521	6600						
Neutron	CN	1521	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
4130	5000	3 (scattered)

D. COMMENTS

No transition logged.
Scattered traces of hydrate below 5000 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 25
D.A. No.: 718
E.P.B. No.: -

NAME: Ashland et al Tedji Lake K-24

K.B.: 347.0 m G.L.: 342.8 m T.D.: 1213.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From To (ft)	Reliability
Resistivity	LL	622	3967	1230	1470	3		
Long-spaced Res.	-							
Sonic (Acoustic)	AC GR	622	3964				scattered	-
Long-spaced Sonic	-							
S.P.	x							
Gamma Ray	x							
Caliper	x							
Density	DENS	622	3974					
Neutron	NEUT	622	3972					
Temperature	-							
E.P.B. Temp.	x			1459				
Velocity	-							
Crystal Cable	-							
Mud Gas	-							

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

Scattered hydrate traces throughout.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 26
D.A. No.: 382
E.P.B. No.: -

NAME: Triad BP Arco CC Hume R. A-53

K.B.: 62.8 m

G.L.: 58.8 m

T.D.: 1159.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	536	3799	1360	1850	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	536	3800				2860	3030	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	536	3799						
Neutron	CN	536	3799						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2860	2875	3
3010	3030	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 27 NAME: Chevron SOBC WM Birch E-53
D.A. No.: 564
E.P.B. No.: -

K.B.: 621.5 m G.L.: 617.2 m T.D.: 684.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	732	2236	740	1160	1			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	732	2242				1160	2070	1-2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	732	2240						
Caliper	x								
Density	FDEN	732	2242						
Neutron	SNP	150	2242						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1160	1220	1	1420	1840	2
1330	1340	1	2060	2070	2
1380	1420	1			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 28
D.A. No.: 156
E.P.B. No.: -

NAME: Socony Mobil - W.M. Birch Y.T. B-34

K.B.: 667.5 m G.L.: 663.5 m T.D.: 1649.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	600	5404	1135	1330	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	600	5404				800	4555	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
800	915	2	4455	4555	1
1320	1680	3			
3870	3880	3			

D. COMMENTS

"Ice" indications on SP below 1700 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 29 NAME: SOBC WM E. Porcupine Y.T. I-13
D.A. No.: 498
E.P.B. No.: -

K.B.: 507.5 m G.L.: 501.4 m T.D.: 2439.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, DILL	70	6600	360	690	1			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	70	6600			1	70	6185	1-2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	3598	6600						
Neutron	SNP	3594	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
70	400	1	5980	6185	2
400	860	2			
3630	3930	2			

D. COMMENTS

Scattered hydrates through most of well.
"Ice" indications on SP between 1320 and 3615 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 30
D.A. No.: 682
E.P.B. No.: -

NAME: Inexco et al Weldon Creek O-65

K.B.: 222.8 m G.L.: 219.0 m T.D.: 2214.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	988	6600	1310	1720	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	988	6600				1720	6600+	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	988	6600						
Neutron	SNP	988	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1720	1920	1	3770	3780	2	4500	4800	3 (streaks)
2385	2400	1	3915	3920	1	4825	4855	2
3065	3115	2	4030	4040	2	4855	5970	3 (streaks)
						6200	6600+	3 (streaks)

D. COMMENTS

"Ice" indications on SP down to 4330 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 31 NAME: Socony Mobil - W.M. Porcupine R. Y.T. K-56
D.A. No.: 118
E.P.B. No.: -

K.B.: 498.0 m G.L.: 494.1 m T.D.: 2286.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	INDE, ML-C	979	6600	2310	2800	3			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	979	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	50	6600						
Caliper	x								
Density	-								
Neutron	x								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

A. WELL INFORMATION

WELL NO.: 32
D.A. No.: 139
E.P.B. No.: -

NAME: Socony Mobil et al Whitestone Y.T. N-26

K.B.: 696.5 m G.L.: 691.3 m T.D.: 2464.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E	1018	6600	< 1018	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	0	6600				1018	6120	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1018	2690	3 (streaks)	4550	4670	2
3980	4050	3	4980	5070	3
4115	4135	3	5860	6120	3

D. COMMENTS

IBPF above RES log top (1018 ft).
"Ice" indications from 2325-2650 ft, 3860-5920 ft, and 5920-6270 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 32A
D.A. No.: 143
E.P.B. No.: -

NAME: Socony Mobil - WM Chance Y.T. G-08

K.B.: 524.3 m G.L.: 518.8 m T.D.: 1579.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	810	5181	1050	1200	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	810	5176				1090	3700	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1090	1280	3 (streaks)	3000	3010	2
1320	1740	3	3510	3700	3
1950	2220	3			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 33
D.A. No.: 583
E.P.B. No.: -

NAME: Chevron SOBC WM E. Porcupine Y.T. F-18

K.B.: 523.0 m G.L.: 518.5 m T.D.: 2050.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL, ML-C	800	6600	<800	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	50	6600				800	6600	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	800	6600						
Neutron	SNP	800	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
800	5080	3⁻ (streaks)
5690	6600	3⁻ (streaks)

D. COMMENTS

No IBPF above log tops.
Hydrate streaks throughout most of well.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 33A
D.A. No.: 58
E.P.B. No.: -

NAME: Western Minerals Chance Y.T. No. 1

K.B.: 539.2 m

G.L.: 534.0 m

T.D.: 2635.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	EL, ML-C	158	6600	<158	420	3			
Long-spaced Res.	-								
Sonic (Acoustic)	S	2000	6600						
Long-spaced Sonic	-						5880	6600+	3
S.P.	x								
Gamma Ray	GRN	290	6600						
Caliper	-								
Density	-								
Neutron	x								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
5880	6020	3
6070	6320	3
6350	6390	3

Interval (ft)		Reliability
6430	6600+	3

D. COMMENTS

IBPF above log top (158 ft).
Low quality transition base pick.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 34 NAME: Shell Peel River Y.T. M-69
D.A. No.: 769
E.P.B. No.: -

K.B.: 291.7 m G.L.: 282.5 m T.D.: 3272.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DLL	1263	6600	1730	2215	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1263	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	1265	6600						
Neutron	CN	1265	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged in sands; however, "hash" on sonic suggests occurrance in shales.
"Ice" indications on SP at 4110-4300 ft and 5300-5950 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 35
D.A. No.: 230
E.P.B. No.: -

NAME: Shell Peel River Y.T. I-21

K.B.: 381.3 m G.L.: 377.3 m T.D.: 2072.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	660	6600	870	1230	1			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	660	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	661	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 36
D.A. No.: 155
E.P.B. No.: -

NAME: Socony Mobil - W.M. N. Cath Y.T. B-62

K.B.: 540.1 m

G.L.: 534.9 m

T.D.: 2138.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, DILL, ML-C	805	6600	<805	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	805	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	x			272					
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above log top (805 ft).
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 37
D.A. No.: 554
E.P.B. No.: -

NAME: Chevron SOBC WM W. Parkin Y.T. C-33

K.B.: 520.0 m G.L.: 514.5 m T.D.: 1256.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	822	4109	1590	1880	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	4109				1590	2950	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	823	4111						
Neutron	SNP	822	4110						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1590	1610	2
2190	2285	2
2870	2950	3

D. COMMENTS

Evidence of ice on sonic above IBPF.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 38
D.A. No.: 759
E.P.B. No.: -

NAME: Gulf Mobil Caribou Y.T. N-25

K.B.: 495.3 m G.L.: 487.7 m T.D.: 3600.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	88	6600	1570	2200	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	88	6600				90	5810	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1025	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
90	590	1	4510	4600	2
1720	1740	2	4900	4925	2
2450	2900	2	5120	5300	2
3250	3310	2	5750	5810	2

D. COMMENTS

Scattered hydrates throughout most of well.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 39 NAME: ARCO Shell Sainville River D-08
D.A. No.: 716
E.P.B. No.: -

K.B.: 203.1 m G.L.: 198.2 m T.D.: 2653.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	1023	6600	1180	1600	1			
Long-spaced Res.	-								
Sonic (Acoustic)	-						-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	175	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No Sonic log; not possible to interpret hydrates.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 40
D.A. No.: 607
E.P.B. No.: -

NAME: Decalta Trans Ocean GCOA Ontaratue I-38

K.B.: 144.6 m G.L.: 138.7 m T.D.: 2287.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	900	6600	< 900	1040	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	900	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above log top.
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 41
D.A. No.: 435
E.P.B. No.: -

NAME: Mobil INC NCO Sun Ontadek L. N-39

K.B.: 97.2 m G.L.: 91.7 m T.D.: 1799.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	708	5897	<707	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	AC-GR	80	5893				2390	2670	3
Long-spaced Sonic	-								
S.P.	-								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2390	2670	3

D. COMMENTS

IBPF above log top (707 ft).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 42
D.A. No.: 257
E.P.B. No.: -

NAME: Shell Peel River Y.T. K-09

K.B.: 349.6 m G.L.: 345.6 m T.D.: 1554.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	563	3089	1260	1750	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	563	3003				1800	5000	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	563	5086						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1800	5000	3 (streaks)

D. COMMENTS

Hydrates occur as streaks only over the interval 1800 to 5000 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 43 NAME: Mobil Gulf Peel Y.T. H-71
D.A. No.: 869
E.P.B. No.: -

K.B.: 512.1 m G.L.: 506.0 m T.D.: 3392.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	102	6600	-	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	102	6600				2720	3700	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1494	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2720	3700	3 (streaks)

D. COMMENTS

IBPF and transition not picked (possible low quality picks at 3370 ft and 3900 ft).
"Ice" indications throughout well.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 44
D.A. No.: 565
E.P.B. No.: -

NAME: Chevron SOBC WM N. Parkin Y.T. D-61

K.B.: 489.2 m

G.L.: 483.1 m

T.D.: 3352.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	0	6600	? 200	-	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	6600				146	5270	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	0	6600						
Neutron	SNP	1204	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
146	520	1	1050	5270	3 (streaks)
535	790	2			
790	1050	1			

D. COMMENTS

"Ice" indications on SP to full depth, notably from surface down to 4250 ft, 4705-4825 and below 5100 ft.
Low quality IBPF pick.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 45
D.A. No.: 559
E.P.B. No.: -

NAME: Texaco Husky et al Porcupine Y.T. G-31

K.B.: 922.0 m G.L.: 917.4 m T.D.: 2657.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	990	6600	< 990	-				
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	990	6600				1260	3230	1
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	990	6600						
Neutron	SNP	990	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1260	1270	1	3200	3230	1
1620	1780	1			
2600±		1			

D. COMMENTS

IBPF above log top (990 ft).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 46
D.A. No.: 204
E.P.B. No.: -

NAME: Atlantic et al Manitou Lake L-61

K.B.: 131.7 m | G.L.: 128.1 m | T.D.: 1724.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, LL, MLL	499	5654	1130	1440	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	499	5646				1400	5650	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1400	1450	3	2750	2920	3	3570	3580	3
2090	2110	3	3110	3150	3	5540	5650	3
2220	2230	3	3500	3520	3			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 47
D.A. No.: 89
E.P.B. No.: -

NAME: Atlantic SW Airport Creek No. 1

K.B.: 149.4 m G.L.: 147.0 m T.D.: 726.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	253	2379	680	1190	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	S	100	2377				1190	2380	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	TEMP	100	2380	720					
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1190	1270	1	1860	2060	2
1270	1860	3	2060	2380	2

D. COMMENTS

Temp gradient change at 720'±

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 48
D.A. No.: 122
E.P.B. No.: -

NAME: Atlantic et al Ontaratue H-34

K.B.: 141.7 m

G.L.: 137.2 m

T.D.: 4075.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	431	6600	<431	900	1			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR	431	6600						
Long-spaced Sonic	-						2620	3010	3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	5628	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2620	3010	3

D. COMMENTS

IBPF above log tops.
"Ice" indications, within shales, for much of depth logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 49
D.A. No.: 563
E.P.B. No.: -

NAME: Shell Sainville River K-63

K.B.: 138.7 m G.L.: 133.8 m T.D.: 790.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL, ML-C	431	2582	1010	1270	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	431	2584				610	1415	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
610	1050	2
1260	1415	2

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 50
D.A. No.: 148
E.P.B. No.: -

NAME: Socony Mobil - W.M. S. Tuttle Y.T. N-05

K.B.: 504.7 m G.L.: 500.5 m T.D.: 3513.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	996	6600	-	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	996	6600				1240	5970	1-2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	50	6600						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1240	1260	1	3770	3820	2
2610	2630	1	4080	4305	2
2710	2930	1	5470	5970	2

D. COMMENTS

No IBPF and transition picked.
"Ice" indications on SP down to 4670 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 51
D.A. No.: 203
E.P.B. No.: -

NAME: Shell Peel River Y.T. K-76

K.B.: 76.5 m G.L.: 72.5 m T.D.: 1386.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	485	4540	960	1200	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	960	4531				960	4170	1-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
960	1490	2	3010	3050	1
1090	1950	2	3090	3220	3
2370	2480	3	3300	4170	3⁻ (streaks)

D. COMMENTS

"Ice" indications on IND E (S.P.) throughout depth of well; possibly reflection of hydrates (see sonic).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 52
D.A. No.: 90
E.P.B. No.: -

NAME: Atlantic N. Circle River No. 1

K.B.: 150.9 m G.L.: 148.4 m T.D.: 691.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	207	2264	930	1210	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	S	100	2262				1000	1550	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	TEMP	50	2262	1200					
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1000	1210	2
1300	1550	3

D. COMMENTS

Temperature profile gradient change at 1200'±.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 53
D.A. No.: 96
E.P.B. No.: -

NAME: Atlantic Circle River No. 1

K.B.: 89.9 m G.L.: 87.5 m T.D.: 811.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	235	2655	800	1210	1			
Long-spaced Res.	-								
Sonic (Acoustic)	S	100	2652				480	2650	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
480	680	1	1500	1750	3 (streaks)
680	1330	3	1900	2650	2 (streaks)
1330	1500	2			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 54 NAME: Shell Peel River Y.T. J-21
D.A. No.: 183
E.P.B. No.: -

K.B.: 45.7 m G.L.: 41.8 m T.D.: 1219.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	497	3981	1010	1310	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	497	3977				497	3977	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

Hydrates (2-3) throughout well.

D. COMMENTS

"Ice" indications on IND E (S.P.) throughout; possibly reflection of hydrates (see sonic).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 55 NAME: Shell Peel River Y.T. L-01
D.A. No.: 210
E.P.B. No.: -

K.B.: 394.7 m G.L.: 390.8 m T.D.: 1834.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	653	6010	1700	2520	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	659	5978				1180	5205	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1180	1260	3	2100	2250	3⁻
1290	1560	3⁻	2760	2920	3⁻
1715	2030	3⁻	5190	5205	3⁻

D. COMMENTS

Thin streaks of hydrate only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 56
D.A. No.: 144
E.P.B. No.: -

NAME: Socony Mobil - W.M. Ellen Y.T. C-24

K.B.: 414.5 m G.L.: 410.0 m T.D.: 2174.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, ML-C	778	6600	<778	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	778	6600				1630	6590	3-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1630	2370	3	4700	4820	3
2800	3270	3	4940	6590	3
3420	4405	3			

D. COMMENTS

IBPF above log top (778 ft).
Hydrates occur as streaks only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 57
D.A. No.: 431
E.P.B. No.: -

NAME: Western Minerals N. Hope Y.T. N-53

K.B.: 350.5 m G.L.: 346.3 m T.D.: 4280.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	1522	6600	< 1522	1975	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1522	6600				2390	5320	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
2390	2420	2	4900	5320	2
2770	3800	3			
3800	4900	3⁻ (scattered)			

D. COMMENTS

IBPF above log top (1522 ft).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 58
D.A. No.: 237
E.P.B. No.: -

NAME: Shell Peel River Y.T. B-06A

K.B.: 66.4 m G.L.: 62.5 m T.D.: 1066.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	368	3492	670	820	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1219	3488				1475	3470	1-2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1219	3491						
Neutron	-								
Temperature	TEMP	0	1410						
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1475	1505	2	3450	2470	1	3040	2	3470
2300	2320	1	2615	2790	1			
2405	2420	2	2960	2965	1			

D. COMMENTS

"Ice" indications on SP log between 370 to 850 ft, 1300 to 1500 ft, and 2520 to 2690 ft.
Possible "relict" permafrost between 1460 to 1710 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 59
D.A. No.: 580
E.P.B. No.:

NAME: CanDel et al Mobil Grandview L-26

K.B.: 164.9 m G.L.: 161.0 m T.D.: 2397.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	1008	6600	2160	2480	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1008	6600				1008	5060	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1008	6600						
Neutron	SNP	1008	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
1008	1060	3				
4170	4410	3				
4520	5060	3				

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 60
D.A. No.: 728
E.P.B. No.: -

NAME: Shell Trail River Y.T. H-37

K.B.: 393.2 m G.L.: 385.3 m T.D.: 3721.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	531	6600	<531	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	531	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	531	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No IBPF or transition logged.
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 61 NAME: Shell Peel River Y.T. H-59
D.A. No.: 266
E.P.B. No.:

K.B.: 33.5 m G.L.: 29.6 m T.D.: 763.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	422	2499	740	920	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	422	2492				650	1960	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	422	2498						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
650	920	3				
1790	1960	3				

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 62
D.A. No.: 464
E.P.B. No.: -

NAME: SOBC WM Shaeffer CK Y.T. O-22

K.B.: 352.0 m G.L.: 347.2 m T.D.: 3161.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, DILL	50	6600	1300	1500	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1200	6600				1700	6600	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	50	6600						
Neutron	SNP	50	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
1700	1970	2				
2220	2560	2				
5180	6600+	2				

D. COMMENTS

A. WELL INFORMATION

WELL NO.: 63 NAME: Shell Arctic Red West G-55
D.A. No.: 494
E.P.B. No.: -

K.B.: 44.5 m G.L.: 39.3 m T.D.: 3322.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	1200	6600	<1200	1540	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1200	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1200	6600						
Neutron	SNP	3600	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above log top (1200').
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 64
D.A. No.: 476
E.P.B. No.: -

NAME: Shell Arctic Red River O-27

K.B.: 136.6 m | G.L.: 131.7 m | T.D.: 2154.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	813	6600	<813	1350	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	813	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	SNP	813	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above log top (813 ft).
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 65
D.A. No.: 233
E.P.B. No.: -

NAME: Shell Peel River Y.T. L-19

K.B.: 95.1 m G.L.: 91.4 m T.D.: 1981.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	50	6494	1050	1200	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	664	6487				750	6487+	2-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
750	1600	3⁻	2560	2615	2	3585	3620	2
1730	1790	2	3000	3430	2	3620+		2-3⁻
1790	2560	3⁻	3450	3585	3			

D. COMMENTS

IND E (S.P.) exhibits "ice" indications throughout; possibly reflection of hydrates (see sonic).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 66
D.A. No.: 534
E.P.B. No.:

NAME: Skelly - Getty Mobil Arctic Red Y.T. C-60

K.B.: 92.0 m G.L.: 86.9 m T.D.: 2599.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	1202	6600	1430	1620	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	217	6600				500	4400	1-2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	5500	6600						
Neutron	SNP	5500	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
217	290	3	1050	1910	3 (streaks)			
500	510	1	1910	2070	2			
580	640	3	4390	4400	2			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 67 NAME: IOE Martin House L-50
D.A. No.: 232
E.P.B. No.: -

K.B.: 88.1 m G.L.: 83.8 m T.D.: 2409.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	850	6600	1400	1650	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	850	6600				1400	4060	3-3^{-}
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1400	2150	3 (streaks)
2680	3130	3 (streaks)
3720	4060	3^{-} (streaks)

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 68 NAME: IOE Satah River G-72
D.A. No.: 240
E.P.B. No.: -

K.B.: 89.6 m G.L.: 86.0 m T.D.: 2286.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	INDE, ML-C	899	6600	1050	1300	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	898	6600				4640	4650	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
4640	4650	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 69
D.A. No.: 547
E.P.B. No.: -

NAME: Pacific et al Peel Y.T. F-37

K.B.: 54.6 m

G.L.: 48.8 m

T.D.: 3368.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	1098	6600	<1098	1270	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1098	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1098	6600						
Neutron	SNP	50	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.
, IBPF above RES log top.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 70
D.A. No.: 553
E.P.B. No.: -

NAME: Chevron SOBC WM E. Pine Creek Y.T. O-78

K.B.: 389.2 m G.L.: 384.4 m T.D.: 947.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	819	3101	<819	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	3102				1375	1410	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1600	3104						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1375	1410	3⁻

D. COMMENTS

5.89 ??

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 71 NAME: SOBC CS Great Bear River N-30
D.A. No.: 521
E.P.B. No.: -

K.B.: 252.5 m G.L.: 248.4 m T.D.: 766.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	674	2514	930	1060	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	674	2516				674	1870	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	2200	2517						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
674	1060	3 (streaks)
1465	1870	2 (streaks)

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 72 NAME: Aquit. Mobil Dodo Canyon K-03
D.A. No.: 552
E.P.B. No.: -

K.B.: 308.7 m G.L.: 303.3 m T.D.: 2748.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	1008	6600	< 1008	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1008	6600				1008	4750	2-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	2500	6600						
Neutron	SNP	5700	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1008	2040	3 (streaks)	2740	3950	3-3⁻ (streaks)
2510	2740	2	4230	4750	3

D. COMMENTS

IBPF above RES log top.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 73 NAME: Sinclair Wolverine Creek D-61
D.A. No.: -
E.P.B. No.: -

K.B.: 310.0 m G.L.: 304.8 m T.D.: 1933.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DIL, MIN-C	1021	6337	1360	1940	3			
Long-spaced Res.	-								
Sonic (Acoustic)	AC-GR	1021	6326				1040	2830	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	DEN	1020	6338						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1040	1060	1
1100	1120	1
1750	2830	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 74 NAME: Aquit Brackett L. C-21
D.A. No.: 622
E.P.B. No.: -

K.B.: 133.2 m G.L.: 129.5 m T.D.: 1536.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	622	5026	1360	1930	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	622	5020				<622	5020	2-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	622	5015						
Neutron	SNP	1000	5015						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
<622	1360	3	1600	1865	3⁻	3350	4325	2
1300	1500	2	1865	2050	2	4325	5020	3
1580	1600	2	2050	3350	3			

D. COMMENTS

S.P. drift (on DILL) suggests "ice" at intervals throughout; possibly reflection of hydrates (see sonic).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 75
D.A. No.: 1021
E.P.B. No.: -

NAME: Esso Norman Wells N-27X

K.B.: 50.2 m G.L.: 44.7 m T.D.: 656.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	166	653	350	485	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	166	645				214	480	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	166	653						
Caliper	x								
Density	CD	166	652						
Neutron	CN	166	652						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
214	216	3
474	480	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 76
D.A. No.: -
E.P.B. No.: -

NAME: Esso Norman Wells N-25X

K.B.: 50.0 m

G.L.: 44.5 m

T.D.: 653.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	164	651	335	480	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	164	641				211	480	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	169	460						
Caliper	x								
Density	CD	164	650						
Neutron	CN	164	650						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
211	215	3⁻
470	480	3⁻

D. COMMENTS

Low quality hydrate picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 77 NAME: Esso Norman Wells P-19X
D.A. No.: -
E.P.B. No.: -

K.B.: 49.6 m G.L.: 44.2 m T.D.: 666.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	169	665	400	510	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	169	655				245	505	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	169	664						
Neutron	CN	169	664						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
245	250	3⁻
500	505	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 78
D.A. No.: 1008
E.P.B. No.: -

NAME: Esso Norman Wells P-15X

K.B.: 51.4 m G.L.: 45.9 m T.D.: 661.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	163	660	385	470	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	163	656				230	492	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	163	660						
Neutron	CN	163	660						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
230	235	3⁻
484	492	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 79 NAME: Esso Bear Island No. 22
D.A. No.: 944
E.P.B. No.: -

K.B.: 55.6 m G.L.: 53.5 m T.D.: 681.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DIFL	250	500	< 250	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	250	680				493	500	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	250	681						
Neutron	CN	250	681						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
493	500	3

D. COMMENTS

IBPF above log top (250 m).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 80
D.A. No.: 920
E.P.B. No.: -

NAME: Esso Mackenzie River No. 1

K.B.: 46.1 m

G.L.: 42.6 m (on river ice)

T.D.: 622.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DIFL	161	622	330	420	3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	-								
Long-spaced Sonic	-						175	180	3⁻
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	161	621						
Neutron	CN	161	621						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
175	180	3⁻

D. COMMENTS

"Ice" indications on SP log from 180 to 450 m.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 81
D.A. No.: 1023
E.P.B. No.: -

NAME: Esso Norman Wells O-23X

K.B.: 50.1 m

G.L.: 44.6 m

T.D.: 683.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	165	682	390	470	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	165	677				235	502	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	165	682						
Neutron	CN	165	682						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
235	241	3
494	502	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 82
D.A. No.: 1034
E.P.B. No.: -

NAME: Esso Norman Wells P-09X

K.B.: 53.2 m G.L.: 47.8 m T.D.: 670.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	165	669	400	490	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	165	666				502	512	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	166	480						
Caliper	x								
Density	CD	165	666						
Neutron	CN	165	666						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
502	512	3⁻

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 83
D.A. No.: 316
E.P.B. No.: -

NAME: Imperial Canol Goose Island (No. 20) L-57

K.B.: 47.0 m G.L.: 43.3 m T.D.: 613.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	313	2010	1420	1700	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	313	2009				710	1700	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
710	770	2
1600	1620	3
1640	1700	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 84
D.A. No.: 915
E.P.B. No.: -

NAME: Esso Norman Wells No. 36X

K.B.: 64.0 m G.L.: 60.3 m T.D.: 1832.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DIFL	160	1790	255	322	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	160	1794				250	350	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRC								
Caliper	x								
Density	FD	25	1794						
Neutron	CN	25	1794						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
250	350	3 (scattered)

D. COMMENTS

Indications of "ice" down to 475 m (SP log).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 84A
D.A. No.: -
E.P.B. No.: -

NAME: Esso Norman Wells O-36X

K.B.: 55.4 m

G.L.: 50.0 m

T.D.: 700.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	115	696	375	495	3-3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	114	687				507	516	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	114	695						
Neutron	CN	114	695						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
507	516	3⁻

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 85 NAME: Esso Norman Wells (44X) B-48
D.A. No.: 954
E.P.B. No.: -

K.B.: 62.8 m G.L.: 58.6 m T.D.: 655.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DI-SFL	162	654	270	375	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	162	655				395	410	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
395	410	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 86 NAME: Esso Norman Wells (45X) P-37
D.A. No.: 958
E.P.B. No.: -

K.B.: 63.0 m G.L.: 59.4 m T.D.: 606.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DISL	159	605	265	365	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	159	605				160	400	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
160	215	3
300	350	2
360	400	2

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 87
D.A. No.: 1004
E.P.B. No.: -

NAME: Esso Norman Wells C-37X

K.B.: 63.6 m

G.L.: 58.9 m

T.D.: 475.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	166	471	280	320	3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	166	461				305	320	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	205	249						
Caliper	x								
Density	CD	9	471						
Neutron	CN	9	471						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
305	320	3⁻

D. COMMENTS

Low quality IBPF and hydrate picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 88 NAME: Esso Norman Wells B-35X
D.A. No.: -
E.P.B. No.: -

K.B.: 69.7 m G.L.: 64.8 m T.D.: 443.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Permafrost Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Gas Hydrates Reliability
Resistivity	DILL	172	443	285	335	3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	172	433				310	335	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	350	425						
Caliper	x								
Density	CD	172	443						
Neutron	CN	172	443						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
310	335	3⁻

D. COMMENTS

Low quality IBPF and hydrate picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 89 NAME: Esso Norman Wells D-42X
D.A. No.: 1028
E.P.B. No.: -

K.B.: 61.2 m G.L.: 57.2 m T.D.: 595.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	170	594	380	435	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	170	585				405	435	3-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	170	594						
Neutron	CN	170	594						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
405	435	3-

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 90 NAME: Esso Norman Wells D-39X
D.A. No.: 1014
E.P.B. No.: -

K.B.: 63.8 m G.L.: 59.2 m T.D.: 522.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	185	518	315	340	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	185	508				305	350	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	185	320						
Caliper	x								
Density	CD	185	518						
Neutron	CN	185	518						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
305	350	3⁻

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 91 NAME: Esso Norman Wells G-30X
D.A. No.: 1002
E.P.B. No.: -

K.B.: 56.8 m G.L.: 52.1 m T.D.: 865.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	271	863	415	470	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	271	854				386	475	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	271	864						
Neutron	CN	271	864						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
386±		3~
425±		3~
445~	475	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 92 NAME: Esso Norman Wells G-24X
D.A. No.: 1000
E.P.B. No.: -

K.B.: 63.0 m G.L.: 57.9 m T.D.: 676.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	201	672	400	450	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	201	662				400	480	3 -
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	204	670						
Caliper	x								
Density	CD	201	669						
Neutron	CN	201	669						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
400	450	3 -
475	480	3 -

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 93 NAME: Esso Norman Wells F-23X
D.A. No.: 1035
E.P.B. No.: -

K.B.: 62.4 m G.L.: 57.9 m T.D.: 478.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	165	503	355	395	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	165	494				375	400	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	103	390						
Caliper	x								
Density	CD	165	503						
Neutron	CN	165	503						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
375	400	3⁻

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 94
D.A. No.: -
E.P.B. No.: -

NAME: Esso Norman Wells B-33X

K.B.: 69.9 m

G.L.: 65.5 m

T.D.: 453.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	160	447	280	325	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	160	437				325	350	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	86	350						
Caliper	x								
Density	CD	160	447						
Neutron	CN	160	447						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
325	350	3⁻

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 95 NAME: Esso Norman Wells C-38X
D.A. No.: -
E.P.B. No.: -

K.B.: 66.5 m G.L.: 61.9 m T.D.: 505.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	166	484	295	345	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	166	475				305	360	3-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	143	330						
Caliper	x								
Density	CD	166	484						
Neutron	CN	166	484						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
305	360	3-

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 96 NAME: Esso Norman Wells K-48X
D.A. No.: -
E.P.B. No.: -

K.B.: 48.7 m G.L.: 43.3 m T.D.: 674.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	165	664	475	512	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	165	656				490	520	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	165	662						
Neutron	CN	165	662						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
490	500	3
510	520	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 97 NAME: Esso Norman Wells M-13X
D.A. No.: -
E.P.B. No.: -

K.B.: 47.7 m G.L.: 43.1 m T.D.: 600.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	164	597	375	485	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	164	590				215	480	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	164	597						
Neutron	CN	164	597						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
215	221	3
475	480	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 98 NAME: Esso Norman Wells N-11X
D.A. No.: -
E.P.B. No.: -

K.B.: 48.4 m G.L.: 43.0 m T.D.: 630.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	162	631	360	480	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	162	622				212	478	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	162	630						
Neutron	CN	162	630						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
212	226	3-
455	465	3
470	478	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 99 NAME: Esso Norman Wells N-23X
D.A. No.: -
E.P.B. No.: -

K.B.: 48.3 m G.L.: 43.9 m T.D.: 651.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	167	646	360	475	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	167	645				466	468	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	167	646						
Neutron	CN	167	646						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
466	468	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 100 NAME: Esso Norman Wells N-31X
D.A. No.: -
E.P.B. No.: -

K.B.: 48.4 m G.L.: 43.7 m T.D.: 730.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Permafrost Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Gas Hydrates Reliability
Resistivity	DILL	164	704	385	545	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	164	695				526	535	3-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	164	664						
Neutron	CN	164	664						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
526	535	3-

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 101 NAME: Esso Norman Wells O-10X
D.A. No.: -
E.P.B. No.: -

K.B.: 49.6 m G.L.: 44.2 m T.D.: 611.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	167	595	325	500	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	166	586				235	493	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	167	591						
Neutron	CN	167	591						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
235	240	3
483	493	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 102 NAME: Esso Norman Wells O-45X
D.A. No.: -
E.P.B. No.: -

K.B.: 57.2 m G.L.: 51.8 m T.D.: 706.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	166	701	430	515	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	166	699				534	544	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	166	701						
Neutron	CN	166	701						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
534	544	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 103
D.A. No.: -
E.P.B. No.: -

NAME: Esso Norman Wells P-11X

K.B.: 52.4 m

G.L.: 47.0 m

T.D.: 668.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	151	667	390	510	3-3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	151	658						
Long-spaced Sonic	-								
S.P.	x						237	506	3⁻
Gamma Ray	x								
Caliper	x								
Density	CD	151	666						
Neutron	CN	151	666						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
237	243	3⁻
497	506	3⁻

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 104 NAME: Esso Norman Wells P-37X
D.A. No.: -
E.P.B. No.: -

K.B.: 58.2 m G.L.: 52.8 m T.D.: 715.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	170	713	430	540	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	170	704				266	438	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	170	713						
Neutron	CN	170	713						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
266	268	3⁻
425	438	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 105 NAME: Esso Norman Wells Q-12X
D.A. No.: -
E.P.B. No.: -

K.B.: 49.4 m G.L.: 43.9 m T.D.: 644.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	164	643	400	490	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	164	634				265	488	3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	164	634						
Neutron	CN	164	634						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
265	268	3⁻
483	488	3⁻

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 106 NAME: Esso Norman Wells Q-17-1X
D.A. No.: -
E.P.B. No.: -

K.B.: 49.5 m G.L.: 44.1 m T.D.: 670.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	162	668	405	500	3-3^{-}			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	162	658				255	510	3^{-}
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	162	668						
Neutron	CN	162	668						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
255	257	3^{-}
505	510	3^{-}

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 107 NAME: Esso Norman Wells R-11X
D.A. No.: -
E.P.B. No.: -

K.B.: 51.8 m G.L.: 46.4 m T.D.: 622.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	165	621	405	495	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	165	612				208	513	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CD	165	621						
Neutron	CN	165	621						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability	Interval (m)		Reliability
208	212	3	507	513	3⁻
225	228	3			
285	288	3			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 108
D.A. No.: 782
E.P.B. No.: -

NAME: BP et al Grey Goose N-70

K.B.: 217.9 m
G.L.: 214.3 m
T.D.: 686.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	339	2238	1025	1820	2-3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	339	2242				380	2150	1-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	339	2244						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)	Reliability
380	390	1	1100	1500	3⁻ (streaks)	2150	2
390	1010	3	1500	1600	3		
1010	1100	2	1600	2100	3⁻ (streaks)		

D. COMMENTS

Thick transition; poor pick for base.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 109 NAME: Sinclair Mahony Lake I-74
D.A. No.: 352
E.P.B. No.: -

K.B.: 310.5 m G.L.: 304.8 m T.D.: 1884.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, MIN C	649	6182	920	-	3			
Long-spaced Res.	-								
Sonic (Acoustic)	AC-GR	649	6177				<650	3330	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	DEN	649	6180						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
<650	910	1	2420	2760	2
910	1800	3	2760	3330	3
1800	2050	2			

D. COMMENTS

No transition zone logged.
"Ice" indications on SP down to about 3050 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 110 NAME: BP et al Russel M-07
D.A. No.: 779
E.P.B. No.: -

K.B.: 274.6 m G.L.: 270.4 m T.D.: 530.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	301	1728	840	1070	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	301	1722				<300	730	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	301	1732						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
<300	730	3

D. COMMENTS

Streaks of hydrates only.

A. WELL INFORMATION

WELL NO.: 111
D.A. No.: 679
E.P.B. No.: -

NAME: CanDel Mobil et al S. Ramparts I-77

K.B.: 596.0 m

G.L.: 591.7 m

T.D.: 1621.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DILL	811	5299	980	1320	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	812	5303						
Long-spaced Sonic	-						2000	5208	3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	810	5302						
Neutron	SNP	812	5302						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability	Interval (m)		Reliability	Interval (m)	Reliability
2000	2200	3	2895±		3	4657±	3
2640	2655	3	2960	2970	3	4710±	3
2685	2690	3	3421±		3	4843±	3
2715±		3	3910	4010	3	5208±	3
2830	2840	3	4500	4510	3		

D. COMMENTS

Hydrates occur at thin streaks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 112
D.A. No.: 448
E.P.B. No.: -

NAME: Banff Aquit GPD Oscar Creek J-48

K.B.: 217.8 m G.L.: 214.7 m T.D.: 461.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	458	1511	640	910	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	25	1510				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	350	1512						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 113 NAME: Mobil Hume River L-09
D.A. No.: 463
E.P.B. No.: -

K.B.: 325.2 m G.L.: 320.2 m T.D.: 2606.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	750	6600	1060	1240	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	50	6600				1055	5430	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	5278	6600						
Neutron	SNP	5278	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1055	1065	1	2975	3020	3			
1210	1290	2	4640	4940	2			
1360	1530	2	5320	5430	2			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 114
D.A. No.: 445
E.P.B. No.: -

NAME: Banff Aquit GPD Oscar Creek H-71

K.B.: 234.8 m G.L.: 231.8 m T.D.: 432.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	567	1417	850	950	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	56	1416				< 300	730	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	567	1417						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
< 300	600	3
600	730	2

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 115
D.A. No.: 540
E.P.B. No.: -

NAME: Amoco PCP A-1 Cranswick A-22

K.B.: 768.4 m

G.L.: 762.5 m

T.D.: 2869.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	50	6600	1330	-	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	6600						
Long-spaced Sonic	-						50	5080	1-2
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1025	6600						
Neutron	SNP	1025	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

"ICE" indications on SP log down to 3550'±.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 116
D.A. No.: 636
E.P.B. No.: 151

NAME: ARCO West Whitefish River H-34

K.B.: 230.9 m

G.L.: 227.2 m

T.D.: 1654.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	660	5347	980	1390	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	660	5422						
Long-spaced Sonic	-						600	5170	2-3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	800	5415						
Neutron	SNP	800	5415						
Temperature	-								
E.P.B. Temp.	x			355					
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
600	1580	3	2220	3200	3
1580	2105	2	5120	5170	2
2150	2220	2			

D. COMMENTS

"Ice" indications on SP down to ±3050 ft.
EPB estimate (to 0° isotherm): 355 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 117 NAME: BP et al White M-04
D.A. No.: 778
E.P.B. No.: -

K.B.: 211.1 m G.L.: 206.8 m T.D.: 483.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	333	1572	680	780	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	332	1573				<333	1520	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	332	1576						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
<333	1520	2 (streaks)

D. COMMENTS

Streaks of hydrates only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 118 NAME: Triad BP Arco Carcajou L-24
D.A. No.: 382
E.P.B. No.:

K.B.: 112.8 m G.L.: 108.8 m T.D.: 1958.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	652	6422	1010	1250	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	652	6412				1440	2200	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	652	6422						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1440	1495	1	2000	2200	1			
1580	1600	1						
1600	2000	3						

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 119
D.A. No.: 446
E.P.B. No.: -

NAME: McD Can GCO S. Maida Creek G-56

K.B.: 118.3 m G.L.: 114.3 m T.D.: 641.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	518	2104	760	900	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	518	2102				890	910	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
890	910	2

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 120 NAME: McD Can GCO Maida Creek F-57
D.A. No.: 441
E.P.B. No.: -

K.B.: 120.4 m G.L.: 116.5 m T.D.: 1482.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	860	4861	965	1470	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	860	4860				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	860	4861						
Neutron	SNP	860	4861						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 121
D.A. No.: 328
E.P.B. No.: -

NAME: Sinclair Whitefish River K-76

K.B.: 241.6 m G.L.: 236.2 m T.D.: 1608.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, MIN C	687	5269	<687	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	AC-GR	687	5264				<687	3720	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	DEN	687	5267						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
<687	3720	2-3 (streaks)

D. COMMENTS

IBPF above log top (687 ft).
Hydrate streaks throughout interval 687 to 3720 ft; shale breaks and fractures below.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 122
D.A. No.: 635
E.P.B. No.: -

NAME: CanDel et al Texaco Arctic Red F-47

K.B.: 791.2 m G.L.: 786.9 m T.D.: 2372.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	883	6600	1060	1250	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	883	660				990	6600+	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	883	6600						
Neutron	SNP	883	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
990	1010	2
1280	1290	3
1550	1560	3
3000	3220	3
3220	3270	3
3320	3600	2
3650	3800	3
3850	3990	3
4120	4200	3
4200	4510	1
4510	4890	2
5590	6000	1
6000	6600+	3

D. COMMENTS

Hydrates relatively continuous through most of interval 3000 to 6000 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 123
D.A. No.: 737
E.P.B. No.: -

NAME: TPPL et al Caracajou J-27

K.B.: 59.4 m G.L.: 54.9 m T.D.: 991.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	676	3241	2050	2530	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	676	3245				2005	2250	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	700	3243						
Neutron	SNP	676	3245						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2005	2250	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 124
D.A. No.: 577
E.P.B. No.: -

NAME: Amoco et al Caracajou K-68

K.B.: 218.5 m G.L.: 213.5 m T.D.: 1376.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	310	4506	1850	1960	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	4510				2890	2995	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	310	4511						
Neutron	SNP	310	4511						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2890	2995	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 125
D.A. No.: 537
E.P.B. No.: -

NAME: ARCO Lost Hill Lake F-62

K.B.: 267.9 m G.L.: 264.3 m T.D.: 1392.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	596	4549	700	1050	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	4553				< 596	4210	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1500	4554						
Neutron	SNP	1300	4554						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
< 596	1890	3
2300	2470	3
3695	4210	3

D. COMMENTS

"Hydrates" interpreted between 2300 and 2470 ft; may be due to fractures.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 126
D.A. No.: 597
E.P.B. No.: -

NAME: Amoco PCP B-1 Cranswick Y.T. A-42

K.B.: 620.0 m G.L.: 613.3 m T.D.: 4267.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	605	6600	< 605	700	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	605	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	6570	6600						
Neutron	SNP	6570	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 127
D.A. No.: 589
E.P.B. No.: -

NAME: CanDel et al SOBC Mountain R. A-23

K.B.: 115.5 m G.L.: 110.4 m T.D.: 1553.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	513	5094	<513	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	514	5096				514	1310	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	514	5093						
Neutron	SNP	514	5094						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
514	860	3
860	1030	2
1030	1310	3

D. COMMENTS

IBPF above log top (513 ft).
"Ice" indications on SP down to ±1400 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 128
D.A. No.: 686
E.P.B. No.: -

NAME: Mesa Murphy CGOA Hanna River J-05

K.B.: 126.5 m G.L.: 122.2 m T.D.: 985.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	508	3210	<508	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	-						-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	508	3214						
Neutron	SNP	507	3213						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above log top (508 ft).
Not possible to interpret hydrates without sonic log.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 129
D.A. No.: 538
E.P.B. No.: -

NAME: ARCO Clarke et al Mountain River H-47

K.B.: 93.9 m

G.L.: 89.9 m

T.D.: 1044.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	617	3521	1790	1940	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	100	3422				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	617	3423						
Neutron	SNP	617	3423						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 130 NAME: SOBC Blackstone Y.T. D-77
D.A. No.: 109
E.P.B. No.: -

K.B.: 645.0 m G.L.: 640.1 m T.D.: 4028.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, ML-C	199	6600	-	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	199	6600				1180	6600+	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	TEMP	0	1065						
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1180	1190	2	2850	2870	2	4610	5080	3
1430	1480	2	3540	3560	2	5340	5980	3
1790	1820	2	3610+			5980	5995	2
2380+		2	4170	4270	3	5995	6600+	3

D. COMMENTS

Hydrates throughout whole well.
SP log indicates "ice": 200-950 ft and 1650-3700 ft.
No IBPF or transition picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 131
D.A. No.: 598
E.P.B. No.: -

NAME: Texaco et al Mallard Y.T. O-81

K.B.: 1117.1 m G.L.: 1112.5 m T.D.: 3200.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	954	6600	< 954	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	20	6600				990	4600	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	3000	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
990	1110	3	1670	1740	3	3620	3690	2
1110	1500	3 (streaks)	1740	1800	2	3910	3950	2
1500	1670	2	2145	2170	2	4480	4600	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 132 NAME: Atlantic et al Shoals C-31
D.A. No.: 234
E.P.B. No.: -

K.B.: 87.8 m G.L.: 83.8 m T.D.: 1982.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	INDE, LL	315	6403	690	950	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	794	6391				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 133
D.A. No.: 806
E.P.B. No.: -

NAME: BP et al Losh Lake G-22

K.B.: 293.4 m G.L.: 289.1 m T.D.: 1226.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	614	4011	1220	1350	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	614	4014				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	614	4015						
Neutron	CN	614	4015						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 134
D.A. No.: 539
E.P.B. No.: 100

NAME: ACRO Clarke et al Hume River D-53

K.B.: 88.4 m G.L.: 83.8 m T.D.: 1267.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	613	4154	1280	1550	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	613	4159				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	613	4159						
Neutron	SNP	613	4159						
Temperature	-								
E.P.B. Temp.	x			100+					
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 135
D.A. No.: 383
E.P.B. No.: -

NAME: Triad BP Arco CC Hume R. O-62

K.B.: 86.9 m G.L.: 83.0 m T.D.: 1403.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	518	4599	710	950	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	518	4598				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 136
D.A. No.: 901
E.P.B. No.: -

NAME: Aquitaine Alder Y.T. C-33

K.B.: 530.0 m G.L.: 523.6 m T.D.: 3714.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (m)	Logged Interval Bottom (m)	Permafrost Base (m)	Permafrost Trans. (m)	Reliability	Gas Hydrates From (m)	Gas Hydrates To (m)	Reliability
Resistivity	DIFL	292	2000	980	1290	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	292	2000				1090	1140	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	1200	2000						
Neutron	CN	1200	2000						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (m)		Reliability
1090+		2
1120	1140	2

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 137
D.A. No.: 571
E.P.B. No.: -

NAME: Chevron SOBC Imp S. Chance Y.T. D-63

K.B.: 707.4 m

G.L.: 701 m

T.D.: 2020.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	1013	6621	1870	2000	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	90	6626						
Long-spaced Sonic	-						2735	4330	1-3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1013	6628						
Neutron	SNP	1013	6628						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
2735	2780	1	4300	4330	1
2950	3310	3 (scattered)			
3530	4200	3 (scattered)			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 138 NAME: Dome Texaco Imp South Peel D-64
D.A. No.: 688
E.P.B. No.: -

K.B.: 588.1 m G.L.: 553.2 m T.D.: 1986.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	76	6457	1150	1380	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	76	6455				2245	5710	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	3890	6454						
Neutron	SNP	3900	6454						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
2245	2555	3	5580	5710	2
3130	3150	2			
3430	3500	2			

D. COMMENTS

Possible scattered hydrates between 2245' and 3500'

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 139
D.A. No.: 205
E.P.B. No.: -

NAME: Atlantic et al Beavertail G-26

K.B.: 111.9 m G.L.: 108.2 m T.D.: 1493.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, MLL	353	4877	510	710	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	355	4880				355	4880	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
355	510	3	4680	4880	2
710	720	2			
2300	4680	3			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 140
D.A. No.: 330
E.P.B. No.: -

NAME: McD GCO Northup Taylor Lake Y.T. K-15

K.B.: 468.8 m G.L.: 464.8 m T.D.: 2378.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	905	6600	2050	2800	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	901	6600				1690	6300	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	905	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1660	1690	3	2030	2070	3	4450	4480	2
1690	1740	1	2690	2700	2	6270	6300	2
1740	1860	3	3700	3570	2			

D. COMMENTS

Hydrates streaks also from 5000 to 6200 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 141
D.A. No.: 397
E.P.B. No.: -

NAME: INC Husky Amoco Blackfly Y.T. M-55

K.B.: 755.0 m G.L.: 749.8 m T.D.: 2069.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	1692	6600	<1692	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1692	6600				2090	4740	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	x								
Neutron	SNP	100	6600						
Temperature	TEMP	100	6533						
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
2090	2160	2	3890	4040	2
2470	2490	2	4450	4740	2
2950	3130	2			

D. COMMENTS

TEMP gradient change at 4000± ft.
IBPF above log (1692 ft).
"Ice" indications on SP down to 5700 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 142 NAME: Murphy Mesa PB Whitestone Y.T. N-58
D.A. No.: 645
E.P.B. No.: -

K.B.: 889.4 m G.L.: 886.1 m T.D.: 2131.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	955	6600	1640	2120	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	954	6600				955	5110	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	2250	6600						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
955	1480	3	3430	4060	3	5050	5110	3
1480	1525	2	4370	4450	3			
1525	2355	3	4880	4905	3			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 143
D.A. No.: 125
E.P.B. No.: -

NAME: Socony Mobil WM Blackie No. 1 Y.T. M-59

K.B.: 562.1 m G.L.: 557.5 m T.D.: 1931.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, ML-C	1103	6258	2100	2930	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR	60	6250				1900	6600+	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1900	2830	2-3 (some gaps)	3610	3620	1
3120	3260	2	4100	5160	2-3 (streaks)
3590	3600	1	5160	6600+	2 (scattered)

D. COMMENTS

Abundant hydrates and relatively thick IBPF interpreted.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 144
D.A. No.: 134
E.P.B. No.: -

NAME: Shell Blackwater Lake G-52

K.B.: 370.3 m

G.L.: 366.0 m

T.D.: 1982.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, ML-C	739	6497	< 739	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR	740	6492				1145	2950	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)		Reliability
1145±	3	2750	2795	3
1625±	3	2940	2950	3
1640±	3			

D. COMMENTS

IBPF above log top (739 ft.)

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 145
D.A. No.: 570
E.P.B. No.: -

NAME: Decalta et al Dome Keele S. A-28

K.B.: 390.4 m

G.L.: 373.9 m

T.D.: 3200.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	1020	6600	< 1020	1250	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1020	6600						
Long-spaced Sonic	-						3870	5390	2-3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	DEN	1020	6600						
Neutron	NEUT	1020	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
3870	5390	2-3

D. COMMENTS

IBPF above RES log top (1020 ft); poor transition base pick.
'Hydrate mostly as streaks only; evidence that may occur to greater depth (i.e. 6600+ ft).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 146
D.A. No.: 655
E.P.B. No.: -

NAME: Decalta CS Mesa Redstone P-78

K.B.: 176.3 m G.L.: 172.0 m T.D.: 1186.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	623	3867	950	1510	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	623	3876				820	3850	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	869	3869						
Neutron	SNP	871	3871						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
820	850	2	2445	2480	2
1610	1820	2	2480	3850	3
2000	2050	2			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 147
D.A. No.: 561
E.P.B. No.: -

NAME: Amoco Candex Shell A-1 Red Dog K-29

K.B.: 560.5 m G.L.: 556.3 m T.D.: 2150.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	68	6600	520	-	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1368	6600				1850	4960	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	754	6600						
Neutron	SNP	754	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1850	1870	2	2260	2270	2
1930	2010	2	3140	3220	3
2100±		2	4950	4960	3

D. COMMENTS

No permafrost transition zone.
Possible "relict" PF (850 to 1340 ft) from "ice" indications on the SP log.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 148
D.A. No.: 467
E.P.B. No.: -

NAME: Cdn. Res. Signal Keller Lake O-13

K.B.: 457.5 m G.L.: 454.4 m T.D.: 942.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	553	3082	920	1130	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	553	3093				550	2280	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	SNP	1100	3094						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
550	920	2	2200	2280	3
920	1240	3			
1950	2000	3			

D. COMMENTS

Scattered hydrates (streaks) throughout the interval 1240 to 3000 ft .

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 149
D.A. No.: 468
E.P.B. No.: -

NAME: Cdn. Res. Signal Keller Lake P-14

K.B.: 392.3 m G.L.: 389.8 m T.D.: 484.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	425	1584	600	770	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	425	1574				< 425	1575+	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1000	1572						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
< 425	660	3	1360	1575+	3
770	1140	3			
1140	1360	2			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 150
D.A. No.: 572
E.P.B. No.: -

NAME: CanDel DECLRI et al Stewart B-30

K.B.: 514.8 m G.L.: 510.5 m T.D.: 2947.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	1014	6600	1360	1680	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1014	6600				1180	3550	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1014	6600						
Neutron	SNP	1014	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1180	1200	2	1940	3550	3
1200	1910	3			
1910	1940	2			

D. COMMENTS

"Ice" indications on SP down to 3550 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 151
D.A. No.: 460
E.P.B. No.: -

NAME: Decalta LRI et al Keele River I-01

K.B.: 289.9 m G.L.: 284.9 m T.D.: 1708.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	549	5593	745	1120	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	549	5593				1400	1650	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	3500	5595						
Neutron	SNP	3500	5594						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1400	1650	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 152
D.A. No.: 141
E.P.B. No.: -

NAME: Shell Keele River L-04

K.B.: 262.9 m G.L.: 258.6 m T.D.: 1293.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, ML-C	745	4042	1310	1420	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	S GR C	50	4041				2290	3830	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
2290	3400	3 (streaks)	3520	3550	2
3400	3420	2	3550	3830	3 (streaks)
3420	3520	3 (streaks)			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 153 NAME: CanDel DECKMG et al Tate J-65
D.A. No.: 557
E.P.B. No.: -

K.B.: 607.5 m G.L.: 601.5 m T.D.: 2834.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	1028	6600	< 1028	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1028	6600				1670	6600+	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1028	6600						
Neutron	SNP	1028	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1670	1700	3	6390	6600+	3
4110	4160	3			
4770	6100	3⁻			

D. COMMENTS

IBPF above log top (1028 ft).
Scattered hydrates through most of well.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 154 NAME: Buttes et al Blackwater Lake I-54
D.A. No.: 488
E.P.B. No.: -

K.B.: 242.2 m G.L.: 238.5 m T.D.: 435.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	992	4509	< 992	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	992	4510				1480	3060	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	992	4511						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
1480	1580	3	2000	3060	3 (scattered)
1600	1750	2			
1850	2000	3			

D. COMMENTS

IBPF above log top (992 ft).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 155 NAME: Candex Amoco Shell Little Bear I-70
D.A. No.: 594
E.P.B. No.: -

K.B.: 416.6 m G.L.: 412.4 m T.D.: 2141.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	754	6600	< 754	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	50	6600				< 754	3310	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	754	6600						
Neutron	SNP	754	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
< 754	1650	2	2410	2635	2	3280	3310	3
1690	1710	2	2680	2790	2			
2160	2340	3	3140+		3			

D. COMMENTS

IBPF above log top (754 ft).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 156
D.A. No.: 497
E.P.B. No.: -

NAME: Candel DECKMG et al East Mackay B-45

K.B.: 259.4 m G.L.: 255.1 m T.D.: 1612.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	627	5280	880	1270	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	627	5282				3990	5280	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1600	5285						
Neutron	SNP	1600	5285						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
3990	5280	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 157
D.A. No.: 496
E.P.B. No.: -

NAME: Candel DECKMG et al Police Island L-66

K.B.: 148.2 m G.L.: 144.2 m T.D.: 1346.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	667	4411	≤667	930	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	667	4414				1000	4260	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	667	4414						
Neutron	SNP	667	4414						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1000	1100	1
1640	2970	3
3130	4260	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 158
D.A. No.: 620
E.P.B. No.: -

NAME: Aquitaine Old fort Point E-30

K.B.: 127.5 m G.L.: 123.4 m T.D.: 787.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	532	2586	790	910	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	532	2583				530	2110	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
530	910	2
2030	2110	2

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 159
D.A. No.: 458
E.P.B. No.: -

NAME: SOBC CS St. Charles Creek H-61

K.B.: 262.9 m G.L.: 259.2 m T.D.: 1114.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	414	3637	710	935	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	414	3638				930	2020	2-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1600	3640						
Neutron	SNP	1600	3640						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
930	1100	2 (streaks)	1960	2020	3
1100	1420	3⁻ (streaks)			
1655	1675	2			

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 160 NAME: CS et al Bluefish K-71
D.A. No.: 675
E.P.B. No.: -

K.B.: 151.9 m G.L.: 148.2 m T.D.: 1574.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	625	5146	1370	1520	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	625	5148				1570	2750	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	3800	5149						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1570	1585	3
1650	1690	3
2550	2750	3

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 161
D.A. No.: 596
E.P.B. No.: -

NAME: Candel DECKMG et al Ft. Norman K-14

K.B.: 115.5 m G.L.: 111.6 m T.D.: 857.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	321	2784	710	890	1			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	321	2796				340	2310	1-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	321	2790						
Neutron	SNP	321	2789						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
340	380	3	2220	2310	1
850	860	1			
900	2220	3⁻ (streaks)			

D. COMMENTS

Occasional thin hydrate streaks only, from 900 to 2220 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 162
D.A. No.: 444
E.P.B. No.: -

NAME: Mobil et al Slater River A-37

K.B.: 132.6 m
G.L.: 128.1 m
T.D.: 1067.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E	422	3496	< 422	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	422	3494				625	2780	2-3-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	70	3305						
Neutron	SNP	2100	3306						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
625	920	3⁻ (streaks)
2020+		3
2660⁻	2780	2

D. COMMENTS

IBPF above log top (422 ft).
Thin hydrate streaks only from 625 to 920 ft.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 163 NAME: HB Gulf Fish Lake G-60
D.A. No.: 665
E.P.B. No.: -

K.B.: 389.5 m G.L.: 385.8 m T.D.: 1676.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	616	5482	1220	1390	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	610	5487				610	2250	1-3
Long-spaced Sonic	-								
S.P.	-								
Gamma Ray	x								
Caliper	x								
Density	FDEN	616	5489						
Neutron	SNP	615	5480						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
610	710	1	1590	1650	3
965	1000	2	1910	2250	3
1320	1370	2			

D. COMMENTS

Very poor IBPF and Base Transition picks.
No SP due to telluric currents.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 164 NAME: Shell Wrigley G-70
D.A. No.: 140
E.P.B. No.: -

K.B.: 550.2 m G.L.: 545.9 m T.D.: 3733.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	E-L, IND E, ML-C	637	6600	1290	-	3			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR	637	6600				< 637	4300	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
< 637	1000	2	1600	1800	3	2620	2800	1
1000	1200	3	1800	2250	1	2800	3480	3
1200	1600	2	2250	2620	3	3650	4300	3

D. COMMENTS

"Ice" inications on SP down to 3950'.
No base of transition pick.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 165 NAME: Imperial Carridge F-72
D.A. No.: 72
E.P.B. No.: -

K.B.: 435.8 m G.L.: 432.8 m T.D.: 689.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	EL, IND E, MLL	308	2258	< 308	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	SONIC	306	2243				308	2050	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GR	306	2243						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
308	575	1	1500	1830	2
575	1190	2	1950	2050	2
1190	1500	1			

D. COMMENTS

IBPF above log top (308').
Pollard and North estimate 550' - 590' for permafrost thickness.
"Ice" indiations on SP from 1260' to 2250'+.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 166
D.A. No.: 123
E.P.B. No.: -

NAME: Shell Ochre River P-15

K.B.: 507.5 m

G.L.: 503.2 m

T.D.: 1488.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	689	4886	< 690	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	690	4882				690	750	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
690	750	2

D. COMMENTS

IBPF above log top.
ML log indicates possible IBPF: 1350' and Base Trans: 1540' or 1740'; but very poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 167
D.A. No.: 664
E.P.B. No.: -

NAME: Decalta SOBC Gulf Am Min Johnson A-12

K.B.: 563.0 m G.L.: 558.7 m T.D.: 1227.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	609	3882	1520	1780	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	608	3879				1650	2550	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1900	3884						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1650	2000	3 (streaks)
2400	2550	2

D. COMMENTS

SP drift apparent down to depth of 3200'+

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 168 NAME: Imperial Lac Tache C-35
D.A. No.: 71
E.P.B. No.: -

K.B.: 309.3 m G.L.: 307.4 m T.D.: 524.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	E-L	188	1496	< 188	340	3			
Long-spaced Res.	-								
Sonic (Acoustic)	SONIC	188	1714				310	940	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	150	1817						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
310	500	2				
680	940	3				

D. COMMENTS

IBPF above log top.
Poor quality transition base pick.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 169
D.A. No.: 569
E.P.B. No.: -

NAME: Union Japex Blackwater E-11

K.B.: 504.4 m G.L.: 500.8 m T.D.: 2171.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	787	6600	1100	1320	3- 5			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	787	6600						
Long-spaced Sonic	-						<787	5450	3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	SNP	2000	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
< 787	2050	3 (streaks)				
2150	2710	3				
5330	5450	3				

D. COMMENTS

Poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 170
D.A. No.: 710
E.P.B. No.: -

NAME: Aquitaine Silvan Plateau G-51

K.B.: 815.0 m

G.L.: 810.7 m

T.D.: 2119.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	413	6600	820	1120	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	413	6600						
Long-spaced Sonic	-						2100	3050	3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	3256	6600						
Neutron	SNP	3256	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
2100	2250	3
2300	3050	3-

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 171
D.A. No.: 487
E.P.B. No.: 94

NAME: Candex et al Dahadinni M-43A

K.B.: 250.7 m G.L.: 248.0 m T.D.: 3130.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, DILL	400	6600	930	1170	3-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	400	6600				605	4170	2-3
Long-spaced Sonic	-								
S.P.	-								
Gamma Ray	GRN	3707	6600						
Caliper	x								
Density	FDEN	400	3702						
Neutron	-								
Temperature	-								
E.P.B. Temp.	x			157					
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability
605	620	2	4145	4170	3
670	680	2			
3750	3970	3			

D. COMMENTS

EPB 0°C isotherm: 157 ft.
Poor quality IBPF and transition base picks (no SP log).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 172
D.A. No.: 56
E.P.B. No.: -

NAME: Decalta et al Champlin Dahadinni D-65

K.B.: 258.3 m

G.L.: 254.0 m

T.D.: 2440.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	696	6600	1120	1350	3-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	696	6600				880	5280	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
880	900	2	4500	4530	2	4790	5020	3
3820	4070	3	4530	4590	3	5280	5280	2
4070	4180	2	4590	4680	2			

D. COMMENTS

Relatively poor IBPF and transition picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 173 NAME: Shell Cloverleaf I-46
D.A. No.: 153
E.P.B. No.: -

K.B.: 444.1 m G.L.: 439.5 m T.D.: 3449.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, ML-C	717	6600	1210	1520	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR	717	6600				1110	6310	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1110	1870	2	2430	2750	3	3340	4740	3
1870	2000	3	2750	2800	2	5175	5420	2
2000	2430	2	2800	3050	3	5610	5660	3
						6240	6310	3

D. COMMENTS

"Ice" indications on SP from 2800 to 6600 ft +.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 174 NAME: Cdn. Res. Signal Keller Lake F-49
D.A. No.: 513
E.P.B. No.: -

K.B.: 281.2 m G.L.: 278.5 m T.D.: 216.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	417	710	<417	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	417	712				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	417	712						
Neutron	SNP	417	713						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

IBPF above log top (417 ft).
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 175 NAME: IOE Trail River P-13
D.A. No.: 360
E.P.B. No.: -

K.B.: 208.0 m G.L.: 205.1 m T.D.: 823.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	469	2671	990	1040	1-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	469	2670				2240	2500	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1100	2668						
Neutron	SNP	1100	2666						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
2240	2280	3				
2445	2500	3				

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 176
D.A. No.: 359
E.P.B. No.: -

NAME: Gulf Amerada Cli Lake G-15

K.B.: 211.7 m

G.L.: 207.0 m

T.D.: 1739.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	624	5656	950	1440	1- 3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	624	5650				4840	5650	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	4350	5650						
Neutron	SNP	4350	5650						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
4840	5190	2				
5190	5650	3 (streaks)				

D. COMMENTS

Poor transition base pick.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 177 NAME: BACH Amerada Cli Lake K-54
D.A. No.: 332
E.P.B. No.: -

K.B.: 214.1 m G.L.: 209.2 m T.D.: 2657.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	625	5995	930	1400	2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	625	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	5998	6600						
Neutron	SNP	5998	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 178 NAME: Fina et al Willow Lake L-59
D.A. No.: 465
E.P.B. No.: -

K.B.: 183.2 m G.L.: 179.3 m T.D.: 838.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	601	2753	770	830	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	601	2752				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	601	2753						
Neutron	SNP	601	2753						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 179
D.A. No.: 68
E.P.B. No.: -

NAME: Imperial Triad Davidson Creek P-02

K.B.: 635.5 m G.L.: 631.9 m T.D.: 834.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	E L, LL	461	2734	800	950	3			
Long-spaced Res.	-								
Sonic (Acoustic)	SONIC	20	2730				330	2570	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	100	2736						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
330	1470	3				
2380	2570	3				

D. COMMENTS

Relatively poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 180 NAME: Imperial Triad Willow Lake B-28
D.A. No.: 70
E.P.B. No.: -

K.B.: 743.6 m G.L.: 740.5 m T.D.: 984.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	E L, LL	683	3221	975	1190	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	SONIC	683	3220				682	2780	2-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
682	1705	3 (streaks)	2720	2780	2			
2230	2335	3						
2555	2720	3						

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 181
D.A. No.: 405
E.P.B. No.: -

NAME: Huskey et al Willow Lake O-27-A

K.B.: 334.4 m

G.L.: 330.7 m

T.D.: 890.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	409	2914	910	1300	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	409	2917						
Long-spaced Sonic	-						1200	2670	1-3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1100	2918						
Neutron	SNP	1100	2918						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
1200	1660	3				
2320	2380	1				
2630	2670	1				

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 182
D.A. No.: 131
E.P.B. No.: -

NAME: IOE Triad Ebbutt D-50

K.B.: 316.7 m

G.L.: 314.8 m

T.D.: 1248.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, LL	377	4097	560	890	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	377	4090				2260	2300	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
2260	2300	3						

D. COMMENTS

Poor transition base pick.
Possibly hydrates only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 183 NAME: IOE Triad Ebbutt J-70
D.A. No.: 137
E.P.B. No.: -

K.B.: 264.9 m G.L.: 262.9 m T.D.: 826.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E, LL	299	2703	520	850	2			
Long-spaced Res.	-								
Sonic (Acoustic)	S GR C	299	2696				810	2635	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
810	840	3				
2600	2635	3				

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 184
D.A. No.: 72
E.P.B. No.: -

NAME: Imperial Triad Harris River F-71

K.B.: 714.1 m

G.L.: 709.9 m

T.D.: 1010.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	E-L, LL	625	3312	910	1290	3			
Long-spaced Res.	-								
Sonic (Acoustic)	SONIC	626	3310				1120	1750	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	150	3314						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
1120	1380	3 (streaks)				
1630	1750	3				

D. COMMENTS

Hydrates streaks only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 185
D.A. No.: 417
E.P.B. No.: -

NAME: Husky HB et al Willow Lake G-32

K.B.: 363.6 m G.L.: 359.4 m T.D.: 836.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	390	2740	670	950	3-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	390	2742				1220	2610	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	980	2743						
Neutron	SNP	390	2743						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
1220	1240	3				
1310	1440	3				
2590	2610	3				

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 186
D.A. No.: 363
E.P.B. No.: -

NAME: Chevron CS Ebbutt G-72

K.B.: 370.3 m G.L.: 367.2 m T.D.: 1290.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E	437	4237	< 437	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	437	4235				3060	3730	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1800	4237						
Neutron	SNP	1800	4237						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)	Reliability
3060	3090	3	3570	3730	3		
3185	3200	3					
3330	3390	3					

D. COMMENTS

IBPF above log tops (437').
Possible traces hydrates only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 187
D.A. No.: 484
E.P.B. No.: -

NAME: Horn R. Gulf Amhess Berry Island A-42

K.B.: 198.9 m

G.L.: 195.2 m

T.D.: 1830.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	617	5997	830	980	3-3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	617	5996				1290	5970	2-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1290	1560	3	4990	5050	3			
3100	3230	3⁻	5210	5215	3			
3310	3370	3⁻	5930	5970	2			

D. COMMENTS

Poor quality picks.
Possible hydrate traces only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 188
D.A. No.: 353
E.P.B. No.: -

NAME: Chevron Homell Lake G-24

K.B.: 713.5 m G.L.: 710.6 m T.D.: 971.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	787	3182	1110	1270	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	787	3184				790	1410	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1825	3185						
Neutron	SNP	1825	3185						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
790	1410	3				

D. COMMENTS

Poor quality picks.
Salt visible on BHCS below 2450'.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 191 NAME: Chevron Harris River A-31
D.A. No.: 346
E.P.B. No.: -

K.B.: 356.3 m G.L.: 353.3 m T.D.: 735.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	251	2409	440	550	3-3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	250	2414				310	1965	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	600	2412						
Neutron	SNP	600	2414						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
310	550	3⁻ (poss. streaks)	1850	1920	3			
710	1010	3⁻ (poss. streaks)	1955	1965	3			
1660	1705	3						

D. COMMENTS

Poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 192
D.A. No.: 345
E.P.B. No.: -

NAME: Chevron CS Berry F-71

K.B.: 230.6 m

G.L.: 226.3 m

T.D.: 1183.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	535	3972	800	1000	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	535	3874						
Long-spaced Sonic	-						1230	1320	3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1600	3875						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
1230	1320	3				

D. COMMENTS

Poor quality picks.
Possible scattered hydrate streaks below 2570'.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 193
D.A. No.: 649
E.P.B. No.: -

NAME: Aquit Highland Lake K-42

K.B.: 361.7 m G.L.: 357.5 m T.D.: 1173.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	537	3845	930	1450	3-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	3838				675	930	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	1400	3847						
Neutron	CN	1400	3847						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
675	930	3						

D. COMMENTS

Poor quality picks.
Possible hydrate traces below 1500', within interbedded sandshale sequence.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 194
D.A. No.: 648
E.P.B. No.: -

NAME: Aquit Highland Lake I-23

K.B.: 463.6 m

G.L.: 459.3 m

T.D.: 833.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	450	2728	815	1060	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	460	2721				506	2390	3-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1400	2727						
Neutron	SNP	1400	2727						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
506	830	3				
2320	2390	3⁻				

D. COMMENTS

Poor quality picks.
Upper "hydrate" interval may be ice.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 195
D.A. No.: 490
E.P.B. No.: -

NAME: Horn River Candel et al Willowlake G-47

K.B.: 294.6 m G.L.: 289.9 m T.D.: 1311.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	496	4297	900	1220	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	494	4297				3680	3750	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	496	4298						
Neutron	SNP	496	4298						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
3680	3750	3				

D. COMMENTS

Relatively poor picks.
Rare hydrate streaks present below 1375'.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 196
D.A. No.: 114
E.P.B. No.: -

NAME: FPC Tenneco Root River I-60

K.B.: 508.7 m G.L.: 503.9 m T.D.: 2612.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, ML-C	1001	6600	<1001	1400	3⁻			
Long-spaced Res.	-								
Sonic (Acoustic)	S-GR-C	1001	6600				1000	2640	2-3⁻
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	1001	6600						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
2080	2100	2				

D. COMMENTS

Poor quality picks.
• IBPF above log top (1001')
Possible rare hydrate streaks (3⁻) within interval 1000' - 2640'.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 197
D.A. No.: 512
E.P.B. No.: -

NAME: Horn River CDR IOE Willowlake R. I-71

K.B.: 254.4 m

G.L.: 251.3 m

T.D.: 917.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	LL	322	3000	545	600	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	318	3003				320	430	1
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	318	3004						
Neutron	SNP	600	3004						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
320	430	1				

D. COMMENTS

Poor quality IBPF and base transition picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 198
D.A. No.: 575
E.P.B. No.: -

NAME: HB et al Willow A-39

K.B.: 628.9 m

G.L.: 625.2 m

T.D.: 1205.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	560	4000	< 560	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	560	4004				560	2140	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	CNFD	561	4004						
Neutron	SNP	561	2708						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)	Reliability
560	690	2	1845	2140	3		
690	900	1					
1290	1440	3					

D. COMMENTS

IBPF above log top (500').

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 199
D.A. No.: 416
E.P.B. No.: -

NAME: Husky HB et al Willowlake H-10

K.B.: 243.7 m G.L.: 239.4 m T.D.: 997.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	322	3261	800±	3~~				
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	322	3268				730	1020	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	386	3268						
Neutron	SNP	322	3266						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
730 1020	2				

D. COMMENTS

Very poor quality IBPF pick; no transition logged.
Possible salt layer visible below 1500'.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 200
D.A. No.: 77
E.P.B. No.: -

NAME: Imperial Windflower G-77

K.B.: 275.4 m

G.L.: 272.4 m

T.D.: 501.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	E-L, IND E, ML-C	163	1644	520	680	3			
Long-spaced Res.	-								
Sonic (Acoustic)	-						-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	10	1643						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

Poor quality picks.
*No hydrates logged (no sonic).

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 201
D.A. No.: 387
E.P.B. No.: -

NAME: IOE Sun Blackstone E-72

K.B.: 306.9 m

G.L.: 302.7 m

T.D.: 1095.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	359	3590	850	1020	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	0	3589				1350	1550	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	2270	3590						
Neutron	SNP	2270	3590						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)		Reliability
1350	1550	3						

D. COMMENTS

Poor IBPF and hydrate picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 202
D.A. No.: 320
E.P.B. No.: -

NAME: Pan Am A-2 Grainger C-42

K.B.: 239.9 m

G.L.: 239.3 m

T.D.: 1071.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	338	3509	580	775	1-2			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	338	3502						
Long-spaced Sonic	-						-	-	-
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	2900	3509						
Neutron	SNP	2900	3509						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 203 NAME: HB Great Planes Simpson D-25
D.A. No.: 425
E.P.B. No.: -

K.B.: 283.2 m G.L.: 278.9 m T.D.: 1046.8 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E	580	3432	< 580	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	580	3432				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	2700	3431						
Neutron	SNP	2700	3431						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

D. COMMENTS

No hydrates logged.
IBPF, if present, above log top (580').

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 204 NAME: Cdn. Super KMG Jean Marie N-73
D.A. No.: 351
E.P.B. No.: -

K.B.: 202.7 m G.L.: 197.8 m T.D.: 874.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	459	2866	840	1500	2-3			
Long-spaced Res.	-								
[illegible]	[illegible]	[illegible]	[illegible]						
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1600	2869						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
2450	2570	3				

D. COMMENTS

Base transition seems very deep.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 205
D.A. No.: 290
E.P.B. No.: 70

NAME: IOE Providence A-47

K.B.: 164.3 m

G.L.: 161.5 m

T.D.: 504.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E	233	2654	< 233	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	233	1653				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	x								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

IBPF if any, above log top (233').
No hydrates logged.
No permafrost interpreted by EPB.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 206
D.A. No.: 309
E.P.B. No.: -

NAME: GPD Noel Mills Lake P-52

K.B.: 224.6 m G.L.: 222.2 m T.D.: 434.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E	249	1422	< 249	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	249	1420				249	360	2
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	250	1019						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
249 360	2				

D. COMMENTS

IBPF if any, above log top (249').

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 207
D.A. No.: 146
E.P.B. No.: -

NAME: Calstan Mills Lake C-03

K.B.: 217.4 m

G.L.: 214.1 m

T.D.: 747.2 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	244	2455	600	950	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	244	2454				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 208
D.A. No.: 507
E.P.B. No.: -

NAME: Horn River Decalta et al Trout R. D-66

K.B.: 244.0 m

G.L.: 240.9 m

T.D.: 690.4 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	243	2263	460	630	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	243	2262				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

No hydrates logged.
Poor quality IBPF picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 209
D.A. No.: 354
E.P.B. No.: -

NAME: Fina Gulf Trainor Lake G-07

K.B.: 427.3 m G.L.: 423.7 m T.D.: 1772.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E	630	5809	< 630	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	630	588				630	680	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	4300	5809						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
630	680	3

D. COMMENTS

IBPF, if present, above log top (630').

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 210 NAME: Atkinson CSP Trout Lake M-51
D.A. No.: 506
E.P.B. No.: -

K.B.: 585.8 m G.L.: 581.3 m T.D.: 2213.5 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	754	6600	1110	1325	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	754	6600				1330	1630	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	6240	6600						
Neutron	SNP	6250	6600						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
1330	1630	3

D. COMMENTS

Poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 211
D.A. No.: 314
E.P.B. No.: -

NAME: Pan Am Pointed Mountain G-62

K.B.: 872.6 m G.L.: 868.7 m T.D.: 4526.3 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	3085	6600	< 3085	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	3085	6600				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	GRN	0	3085						
Caliper	x								
Density	-								
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

IBPF, if present, above log top (3085').
No hydrates logged.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 212 NAME: Shell H.B. Gumbler I-72
D.A. No.: 343
E.P.B. No.: -

K.B.: 272.5 m G.L.: 269.4 m T.D.: 771.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	342	2524	520	900	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	AC GR	341	2523				550	870	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	DENS	342	2528						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
550	720	3				
830	870	3				

D. COMMENTS

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 213
D.A. No.: 343
E.P.B. No.: -

NAME: Tex. Amoco N. Tathlina I-72

K.B.: 272.5 m G.L.: 269.4 m T.D.: 771.1 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	442	4273	570	900	3/3~~			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	442	4269				1590	2065	3~
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FD	3000	4264						
Neutron	CN	3000	4264						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

Very poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 214
D.A. No.: 654
E.P.B. No.: -

NAME: Pacific HB Alexandra O-54

K.B.: 299.6 m G.L.: 295.7 m T.D.: 1185.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	DILL	485	3890	710	820	3-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	485	3880				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	2400	3890						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

No hydrates logged.
Poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 215
D.A. No.: 404
E.P.B. No.: -

NAME: Gobles et al Celibeta D-66

K.B.: 433.7 m

G.L.: 429.2 m

T.D.: 2606.6 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	DILL	918	6600	< 918	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	918	6600				1020	2525	1-3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1200	6600						
Neutron	—								
Temperature	—								
E.P.B. Temp.	—								
Velocity	—								
Crystal Cable	—								
Mud Gas	—								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)		Reliability	Interval (ft)	Reliability
1020	1220	1	2490	2525	2		
1800	1870	2					
2050	2175	2					

D. COMMENTS

IBPF, if any, above log top (918').
Relatively continuous "ice" indications to 2500' on sonic.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 216
D.A. No.: 311
E.P.B. No.: -

NAME: Shell HB Grumbler F-07

K.B.: 271.0 m

G.L.: 268.2 m

T.D.: 698.0 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	205	2291	600	840	2-3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	205	2289						
Long-spaced Sonic	-						240	290	3
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	1000	2291						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
240	290	3				

D. COMMENTS

Poor quality picks.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 217
D.A. No.: 209
E.P.B. No.: -

NAME: Union Pan Am Trainor L-59

K.B.: 574.9 m

G.L.: 569.7 m

T.D.: 1982.7 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Permafrost Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Gas Hydrates Reliability
Resistivity	IND E, DILL, ML-C	1100	6492	< 1100	-	-			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	1100	6485				-	-	-
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	5492	6492						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)	Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability

D. COMMENTS

No hydrates logged.
IBPF, if any, above log top (1100').

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 189
D.A. No.: 493
E.P.B. No.: -

NAME: Horn River Shell Levis D-76

K.B.: 243.4 m

G.L.: 240.9 m

T.D.: 445.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	180	1463	380	690	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	180	1462				760	1020	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	180	1463						
Neutron	-								
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability	Interval (ft)	Reliability	Interval (ft)	Reliability
760	800	3				
890	900	3				
1005	1020	3				

D. COMMENTS

Poor picks.
Hydrate traces only.

N.W.T. AND Y.T. PERMAFROST/GAS HYDRATES STUDY: ANALYSIS DETAIL

A. WELL INFORMATION

WELL NO.: 190
D.A. No.: 491
E.P.B. No.: -

NAME: Horn River Candel et al Ebbutt J-05

K.B.: 595.3 m G.L.: 592.3 m T.D.: 1268.9 m

B. PERMAFROST AND GAS HYDRATE DATA

Log Name	Avail/Type	Logged Interval Top (ft)	Logged Interval Bottom (ft)	Permafrost Base (ft)	Permafrost Trans. (ft)	Reliability	Gas Hydrates From (ft)	Gas Hydrates To (ft)	Reliability
Resistivity	IND E	504	4164	740	1060	3			
Long-spaced Res.	-								
Sonic (Acoustic)	BHCS	504	4163				504	1110	3
Long-spaced Sonic	-								
S.P.	x								
Gamma Ray	x								
Caliper	x								
Density	FDEN	504	4164						
Neutron	SNP	504	4164						
Temperature	-								
E.P.B. Temp.	-								
Velocity	-								
Crystal Cable	-								
Mud Gas	-								

C. DETAILED GAS HYDRATE INTERPRETATION

Interval (ft)		Reliability
504	1110	3 (see below)

D. COMMENTS

Poor quality picks.
Some definite thin hydrate streaks (reliability 1,2).