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## **Canada's Discovered Oil and Gas Resources North of 60**

### **Abstract**

The total discovered recoverable oil and gas resources for Canada north of 60 degrees are 1,665 million barrels of oil and 31,252 billion cubic feet of natural gas. Initial recoverable resources by territory are, Northwest Territories – 1,330 MMB oil and 14,930 Bcf gas, Nunavut – 323 MMB oil and 15,963 Bcf gas, and the Yukon – 12 MMB oil and 359 Bcf gas.

In Northern Canada 45 fields have discovered oil with original recoverable resources of 1,665 MMB, of which 230 MMB has been produced to December 31, 2004. There are 84 fields with initial recoverable gas of 31,252 Bcf, of which only 696 Bcf has been produced to December 31, 2004. There are 99 discovered fields, 29 oil and gas, 16 only oil and 54 only gas. The 29 fields with oil and gas contain 1,059 MMB of recoverable oil and 11,349 Bcf of recoverable gas. The 16 oil fields have 606 MMB and the gas only fields have 19,903 Bcf of gas.

Fields with oil production include Norman Wells, discovered in 1920, Bent Horn (1974), Amauligak (1983) and Cameron Hills (2003). Gas fields with production include Beaver River, Pointed Mountain, Kotaneelee, Liard K-29, Liard P-66, Ft. Liard F-36, SE Ft Liard N-01, Cameron Hills, and Ikhil.

The largest discovered oil resource is the 1 billion barrels in the Beaufort/Mackenzie. Largest discovered recoverable gas resource is in the Sverdrup Basin with 17.4 Tcf, followed by the Beaufort/Mackenzie with 9.7 Tcf.

### **Sedimentary Basins of Northern Canada**

A wide diversity of basins characterizes Canada's sedimentary area north of 60 degrees north. The sedimentary basins of Northern Canada (figure 1) occupy an area of 2.5 million square kilometres (965,255 square miles), with approximately 62% offshore. Significant occurrences of oil and gas have been discovered in several of the basins.

### **Historical**

One of Canada's earliest oil discoveries was made at Norman Wells in 1920. The Norman Wells oil field has produced 226 million barrels of oil to December 31, 2004, with remaining oil reserves of 76 million barrels. Significant discoveries were made in the Mackenzie Beaufort Basin and the Arctic Islands in the 1970's and 1980's. A resurgence of activity has resulted in discovery of oil and gas in the Cameron Hills and gas discoveries in the Liard Plateau.

Drilling activity, as shown in figure 3, has been sporadic over the years, with increased activity in the war years, during the early 1970's, and the major development drilling at Norman Wells in the mid 1980's. The mainland Territories has had a resurgence of activity in the late 1990's and into the current decade. A total of 1,544 wells have been drilled to the end of 2004, of which approximately 980 have been exploratory.

The first discovery in the Arctic Islands was Drake Point, which blew out in 1969. This is the largest discovery in the Arctic Islands Sverdrup Basin, with 5.4 Tcf of recoverable gas resource. The first discovery in the Mackenzie Beaufort Basin was the Cretaceous Atkinson Point oil discovery in 1970, with 42 million barrels of recoverable oil. The most significant discovery to date is the Taglu gas discovery in 1971, with 2.7 Tcf of recoverable gas.

A listing of oil and gas discoveries, as of December, 2004, is shown in table 1. A total of 99 fields are listed, with recoverable resources of 1,665 million barrels of oil and 31,252 billion cubic feet of natural gas. To the end of 2004, cumulative oil production was 230 million barrels of oil (13.8% of the total) and cumulative gas production of 696 billion cubic feet (2.2% of the total resource).

The remaining discovered oil and gas resources in Northern Canada are large and an additional large volume remains to be discovered.

### **Stratigraphic Distribution**

Discovered oil and gas north of 60 occurs in reservoirs ranging in age from the Cambrian to the Miocene (figure 4). Cambrian gas been discovered in the Colville Hills of the Northwest Territories, with recoverable gas resources of 262 Bcf. Devonian oil and gas occurs in the Southern Territories and Liard Plateau, with 1.25 million barrels of recoverable oil and 1,352 Bcf of recoverable gas. The only discovery in the Mackenzie Plain is the Devonian Kee Scarp oil discovery at Norman Wells, with 302 million barrels recoverable. Lower Paleozoic (Ordovician to Devonian) oil and gas has also been discovered along the southern basin margin of the Mackenzie/Beaufort Basin. There is one Devonian oil field, Bent Horn, in the Arctic Islands, which was abandoned in 1997, after producing 2.84 million barrels.

Carboniferous to Permian oil and gas has been discovered in the Liard area and the Eagle Plains, with total recoverable resources of 12 million barrels of oil and 104 Bcf of natural gas. The major Mesozoic oil and gas discoveries occur in the Arctic Islands Sverdrup Basin and along the basin margin of the Beaufort Mackenzie. The Mesozoic discoveries of Beaufort Mackenzie are primarily Cretaceous with recoverable resource of 66 million barrels of oil and 1,400 Bcf of gas. The Mesozoic dominates the discoveries of the Arctic Islands Sverdrup Basin with 332 million barrels of recoverable oil and 17,383 Bcf of recoverable gas.

Tertiary oil and gas discoveries occur in the prograding deltaic sequences of the Beaufort Mackenzie Basin, with 939 million barrels of recoverable oil and 8,295 billion cubic feet of recoverable gas. The one field in Baffin Bay has an estimated 2.3 Tcf in a Paleocene sandstone.

## **Production from Canada's Northern Basins**

Basins with production north of 60 include, Southern Territories, Liard Plateau, Mackenzie Plain, Beaufort Mackenzie, and Arctic Islands Fold Belt. Annual production of oil and gas from Canada's northern basins is shown in figures 5 and 6. Oil and gas production from the Southern Territories began in February 2002 from the Devonian in the Cameron Hills. Cumulative production to December 31, 2004 is 490 thousand barrels of oil and 11.4 Bcf of gas. Cumulative gas production from the Liard Plateau is 682 Bcf. The Norman Wells oil field has produced 226 million barrels of oil, and production in December, 2004 was 19,973 barrels a day.

First production from the Mackenzie Delta was in July, 1999 from the Ikhil gas field, which provides local production to the town of Inuvik. Cumulative production to December 31, 2004 is 2.6 Bcf. In the Beaufort Sea a total of 317,000 barrels of oil was produced to a tanker in 1986.

In the Arctic Islands oil was shipped by tanker every summer from the Bent Horn field for the years 1985 To 1996. A total of 2.8 million barrels was produced with the field being abandoned in 1997. The oil reservoir is a thrust faulted Devonian carbonate below the southern margin of the Sverdrup Basin.

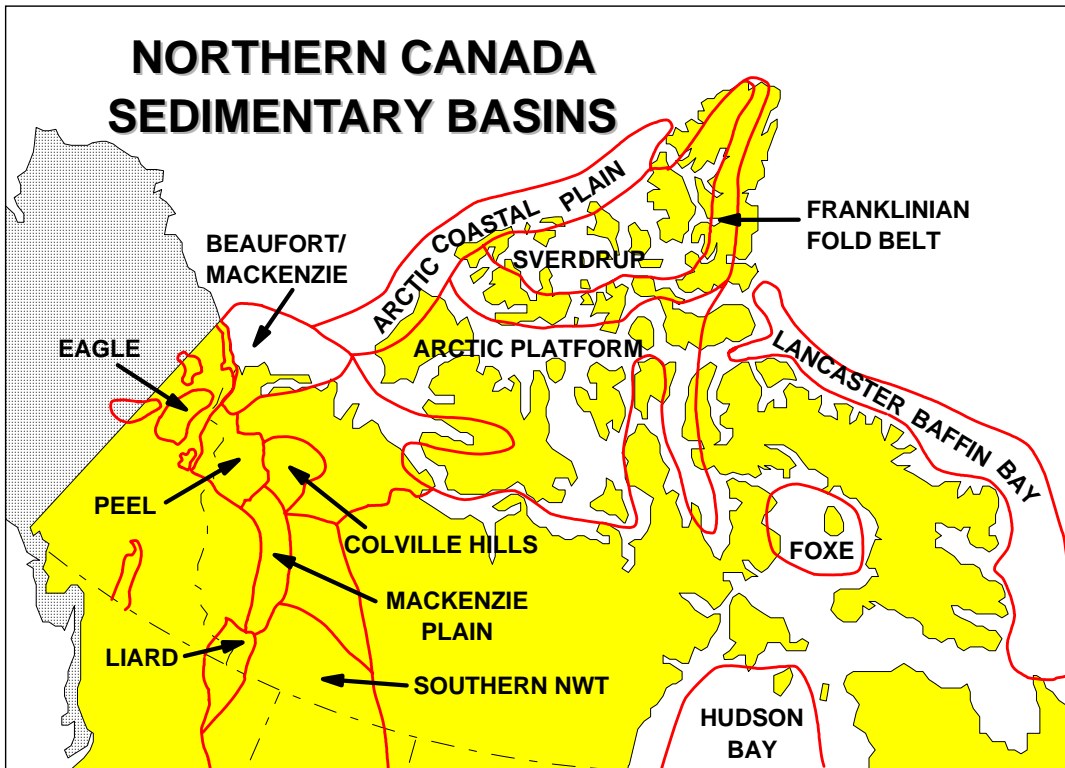


Figure 1. Sedimentary basin areas of Canada north of 60°N

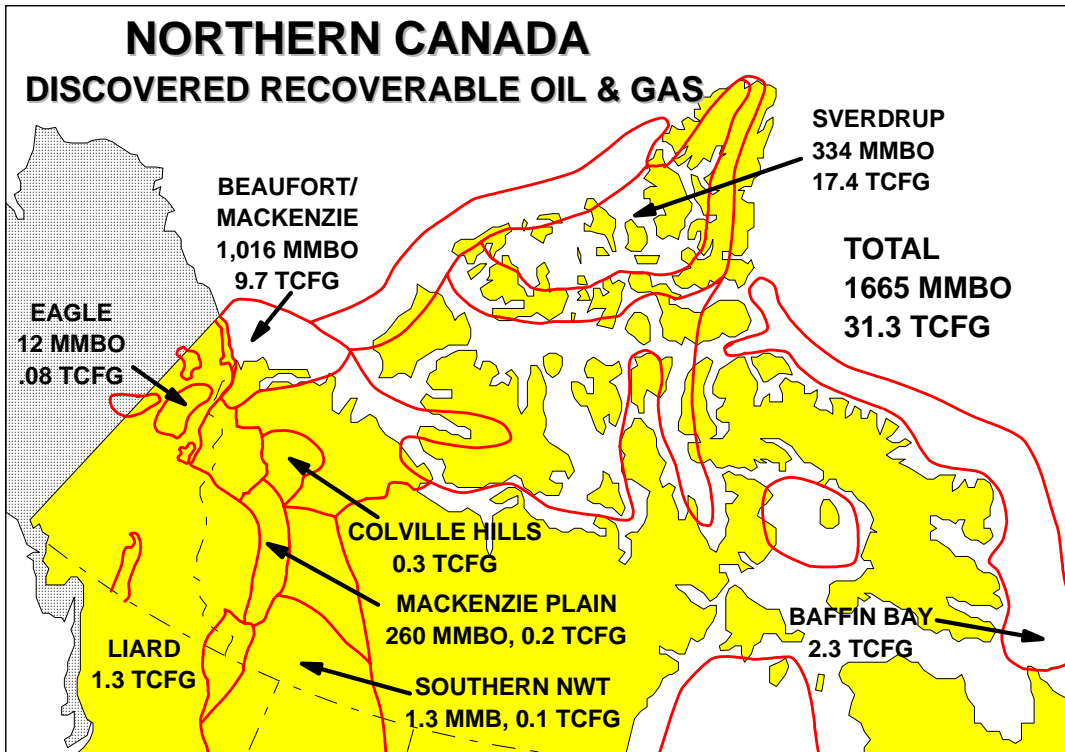


Figure 2. Discovered oil and gas resources for Canada north of 60°N

## NORTHERN CANADA - TOTAL WELLS DRILLED

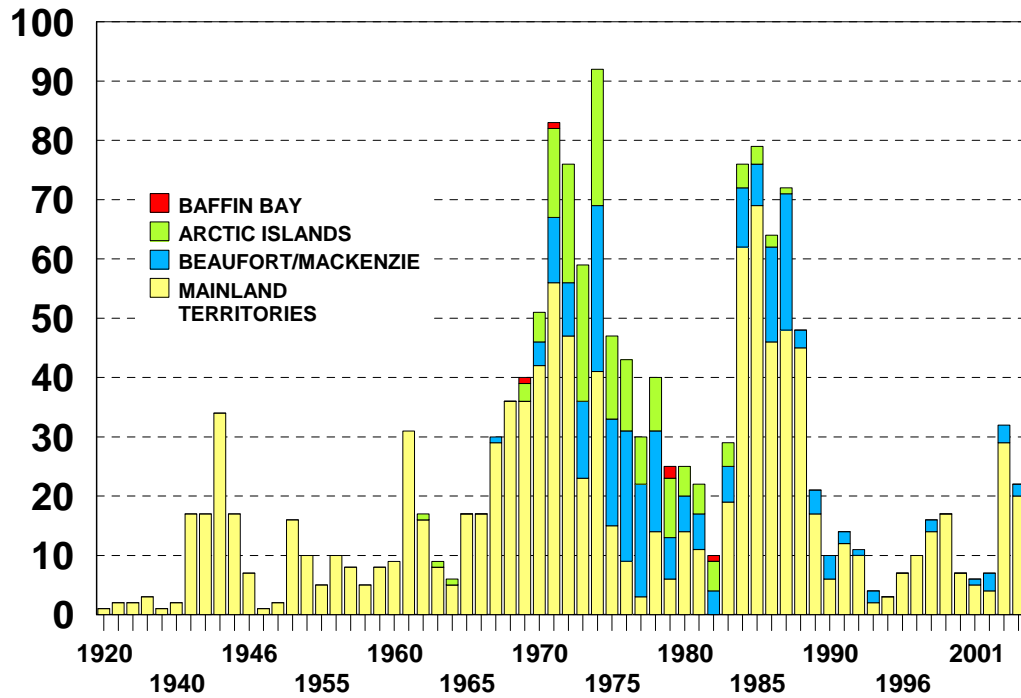


Figure 3. Total wells (exploratory and development) drilled in Canada north of 60°N

## NORTHERN CANADA DISCOVERED RESOURCES BY STRATIGRAPHIC SYSTEM

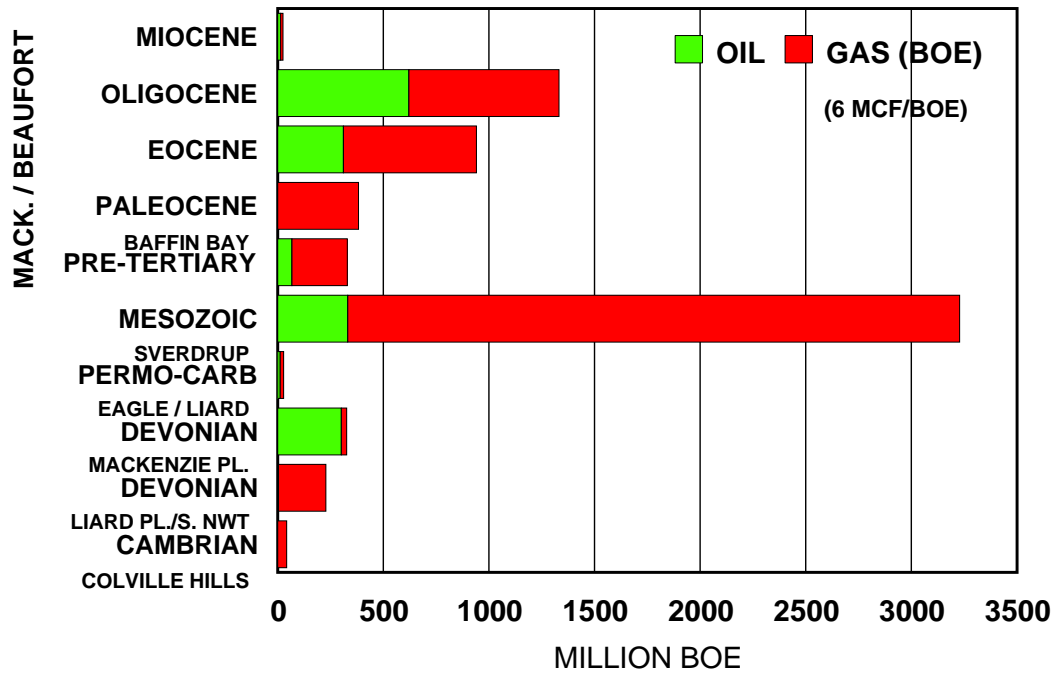


Figure 4. Discovered Oil and Gas resources for Canada north of 60°N by Stratigraphic Age

## NORTHERN CANADA - GAS PRODUCTION

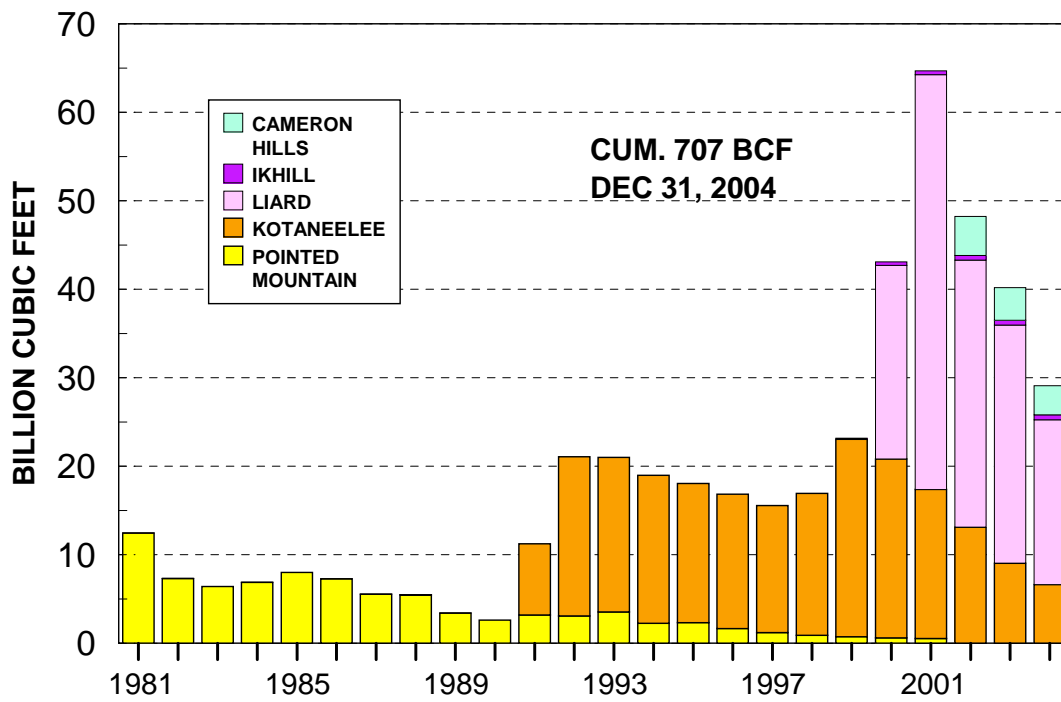


Figure 5. Annual Gas Production from Fields North of 60°N

## NORTHERN CANADA - OIL PRODUCTION

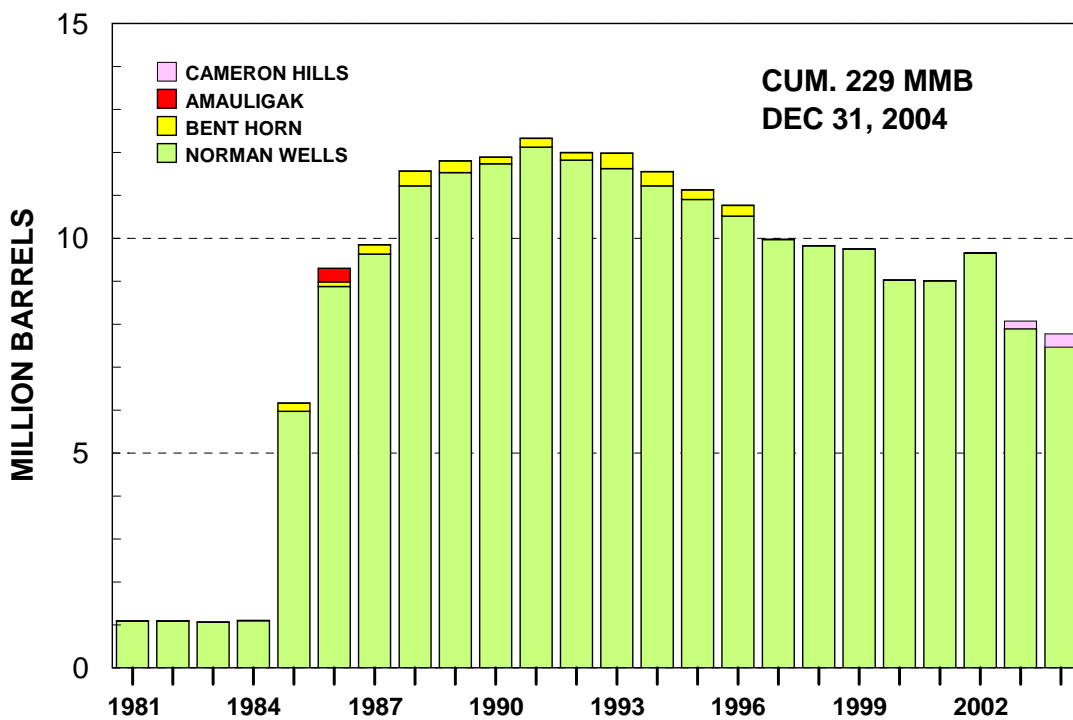


Figure 6. Annual Oil Production from Fields North of 60°N

**TABLE 1: OIL AND GAS DISCOVERIES - CANADA NORTH OF 60°**  
(OIL - MILLION BARRELS ; GAS - BILLION CUBIC FEET) (CUM PROD TO DEC. 31, 2004)

FIELD/POOL	AREA	ON_OFF	REC_OIL	CUMOIL	REC_GAS	CUM_GAS	YEAR
BELE	CH	ONSH	0.00	0.00	91.61	0.00	1986
TEDJI LAKE	CH	ONSH	0.00	0.00	34.77	0.00	1974
TWEED LAKE	CH	ONSH	0.00	0.00	136.08	0.00	1985
BIRCH	EP	ONSH	0.00	0.00	9.30	0.00	1965
BLACKIE	EP	ONSH	0.00	0.00	23.30	0.00	1964
CHANCE	EP	ONSH	11.71	0.00	51.10	0.00	1959
BEAVER RIVER (YU)	LP	ONSH	0.00	0.00	7.75	7.70	1969
BOVIE LAKE J-72	LP	ONSH	0.00	0.00	6.30	0.00	1967
KOTANEELEE	LP	ONSH	0.00	0.00	264.00	211.35	1964
LA BICHE F-08	LP	ONSH	0.00	0.00	62.85	0.00	1971
RANGER FT. LIARD P-66A	LP	ONSH	0.00	0.00	5.00	2.20	1998
PARAMOUNT FT. LIARD F-36	LP	ONSH	0.00	0.00	35.00	7.26	1987
PARAMOUNT SE FT. LIARD	LP	ONSH	0.00	0.00	20.00	6.90	1987
CHEVRON FT. LIARD K-29	LP	ONSH	0.00	0.00	575.00	130.74	1999
POINTED MOUNTAIN	LP	ONSH	0.00	0.00	316.00	315.73	1967
NORMAN WELLS	MP	ONSH	301.64	226.32	156.00	0.00	1920
ARROWHEAD B-41	ST	ONSH	0.00	0.00	8.80	0.00	1989
ARROWHEAD G-69	ST	ONSH	0.00	0.00	3.80	0.00	1985
CAMERON F-51	ST	ONSH	0.00	0.00	1.17	0.00	1969
CAMERON M-31	ST	ONSH	0.00	0.00	2.13	0.00	1979
CAMERON HILLS	ST	ONSH	1.25	0.49	20.50	11.39	1968
CELIBETA H-78	ST	ONSH	0.00	0.00	4.97	0.00	1960
GRUMBLER G-63	ST	ONSH	0.00	0.00	1.21	0.00	1969
NETLA C-07	ST	ONSH	0.00	0.00	21.10	0.00	1961
RABBIT LAKE O-16	ST	ONSH	0.00	0.00	11.29	0.00	1955
S. ISLAND RIVER M-41	ST	ONSH	0.00	0.00	1.70	0.00	1964
TATHLINA N-18	ST	ONSH	0.00	0.00	2.49	0.00	1973
TRAINOR LAKE C-39	ST	ONSH	0.00	0.00	0.96	0.00	1965
ADGO F-28	BM	OFFSH	38.91	0.00	119.73	0.00	1974
ATKINSON H-25	BM	ONSH	42.40	0.00	0.00	0.00	1970
GARRY N. G-07	BM	OFFSH	0.00	0.00	10.99	0.00	1978
GARRY S. P-04	BM	OFFSH	57.17	0.00	274.28	0.00	1976
HANSEN G-07	BM	OFFSH	4.33	0.00	172.78	0.00	1986
IKHIL K-35	BM	ONSH	0.00	0.00	27.47	2.61	1986
IMNAK J-29	BM	ONSH	10.36	0.00	0.00	0.00	1975
IVIK J-26	BM	ONSH	5.95	0.00	0.00	0.00	1972
IVIK K-54	BM	ONSH	4.25	0.00	0.00	0.00	1973
KAMIK D-48	BM	ONSH	1.15	0.00	0.00	0.00	1975
KUGPIK O-13	BM	ONSH	3.99	0.00	0.00	0.00	1973
KUMAK J-06	BM	ONSH	12.15	0.00	26.62	0.00	1974
MALLIK L-38	BM	ONSH	0.00	0.00	28.18	0.00	1972
MAYOGIAK J-17	BM	ONSH	4.11	0.00	0.00	0.00	1971
NIGLINTGAK H-30	BM	ONSH	21.35	0.00	504.41	0.00	1973
PARSONS F-09	BM	ONSH	0.00	0.00	1,334.43	0.00	1973
PELLY B-35	BM	OFFSH	0.00	0.00	110.31	0.00	1975
REINDEER F-36	BM	ONSH	0.00	0.00	16.71	0.00	1973
TAGLU G-33	BM	ONSH	0.00	0.00	2,269.94	0.00	1971
TITALIK K-26	BM	ONSH	0.00	0.00	59.35	0.00	1973
TUK J-29	BM	ONSH	1.23	0.00	0.00	0.00	1985
TUK M-09	BM	ONSH	0.00	0.00	203.34	0.00	1984
UNAK L-28	BM	ONSH	0.00	0.00	38.94	0.00	1986
UNIPKAT N-12	BM	ONSH	34.85	0.00	14.23	0.00	1990

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(OIL - MILLION BARRELS ; GAS - BILLION CUBIC FEET) (CUM PROD TO DEC. 31, 2004)

FIELD/POOL	AREA	ON_OFF	REC_OIL	CUMOIL	REC_GAS	CUM_GAS	YEAR
W. ATKINSON L-17	BM	OFFSH	6.12	0.00	0.00	0.00	1982
YA YA N. A-28	BM	ONSH	0.00	0.00	56.01	0.00	1974
YA YA S. P-53	BM	ONSH	0.00	0.00	51.54	0.00	1973
ADLARTOK P-09	BM	OFFSH	112.59	0.00	0.00	0.00	1985
AMAULIGAK J-44	BM	OFFSH	235.01	0.32	1,516.97	0.00	1983
AMERK O-09	BM	OFFSH	0.00	0.00	21.43	0.00	1985
ARNAK K-06	BM	OFFSH	2.69	0.00	41.72	0.00	1986
HAVIK B-41	BM	OFFSH	37.21	0.00	0.00	0.00	1983
W AMAULIGAK I-65A/O-86	BM	OFFSH	19.62	0.00	66.33	0.00	1986
ISSERK E-27	BM	OFFSH	0.00	0.00	3.58	0.00	1978
ISSUNGNAC O-61	BM	OFFSH	30.04	0.00	1,195.99	0.00	1980
ITİYOK I-27	BM	OFFSH	5.06	0.00	96.13	0.00	1983
KADLUK O-07	BM	OFFSH	0.00	0.00	75.30	0.00	1984
KENALOOAK J-94	BM	OFFSH	0.00	0.00	194.78	0.00	1979
KIGGAVIK A-43	BM	OFFSH	0.00	0.00	127.10	0.00	1982
KINGARK J-54	BM	OFFSH	16.13	0.00	48.02	0.00	1989
KOAKOAK O-22	BM	OFFSH	81.47	0.00	280.39	0.00	1981
KOPANOAR M-13/21-44	BM	OFFSH	68.29	0.00	28.81	0.00	1979
MINUK I-53	BM	OFFSH	0.00	0.00	89.73	0.00	1986
NEKTORALIK K-59	BM	OFFSH	14.11	0.00	70.28	0.00	1976
NERLERK M-98	BM	OFFSH	30.55	0.00	0.00	0.00	1979
NETSERK F-40	BM	OFFSH	0.00	0.00	121.44	0.00	1975
NIPTERK L-19	BM	OFFSH	16.83	0.00	14.92	0.00	1985
NIPTERK P-32	BM	OFFSH	12.05	0.00	130.33	0.00	1989
PITSIULAK A-05	BM	OFFSH	25.12	0.00	0.00	0.00	1984
S. ISSERK I-15	BM	OFFSH	13.95	0.00	116.66	0.00	1990
TARSIUT A-25	BM	OFFSH	46.56	0.00	31.17	0.00	1979
UKALERK C-50	BM	OFFSH	0.00	0.00	104.38	0.00	1977
BENT HORN	FB	ONSH	2.84	2.84	0.00	0.00	1974
DRAKE POINT	SV	ONSH	0.00	0.00	5,369.00	0.00	1969
HECLA	SV	OFFSH	12.05	0.00	3,720.00	0.00	1972
WHITEFISH	SV	OFFSH	0.00	0.00	2,131.00	0.00	1979
KRISTOFFER	SV	ONSH	0.00	0.00	1,107.00	0.00	1972
JACKSON BAY	SV	OFFSH	0.00	0.00	1,074.00	0.00	1976
THOR	SV	ONSH	3.00	0.00	715.00	0.00	1972
CAPE ALLISON	SV	OFFSH	44.50	0.00	614.00	0.00	1985
MACLEAN	SV	OFFSH	48.75	0.00	604.00	0.00	1981
KING CHRISTIAN	SV	ONSH	0.00	0.00	588.00	0.00	1971
ROCHE POINT	SV	OFFSH	0.00	0.00	427.00	0.00	1978
CHAR	SV	OFFSH	3.00	0.00	377.00	0.00	1980
SKATE	SV	OFFSH	29.00	0.00	221.00	0.00	1981
CISCO	SV	OFFSH	175.20	0.00	204.00	0.00	1981
WALLIS	SV	ONSH	0.00	0.00	98.00	0.00	1973
MACMILLAN	SV	OFFSH	0.15	0.00	76.00	0.00	1983
SCULPIN	SV	OFFSH	0.00	0.00	58.00	0.00	1982
BALAENA	SV	OFFSH	16.45	0.00	0.00	0.00	1980
HEKJA O-71	BF	OFFSH	0.00	0.00	2,300.00	0.00	1979
TOTAL			1,665.14	229.97	31,251.88	695.89	

ST - Southern Territories, LP - Liard, MP - Mackenzie Plain, CH - Coleville Hills, EP - Eagle Plains,  
BMB - Mackenzie/Beaufort, SV - Sverdrup Basin, FB - Franklinian Fold Belt, BF - Baffin Bay