ABSTRACT

This study employs an integrated approach to derive reservoir parameters and provides an overview c petrophysical characteristics for post-2000 conventional discovered oil and gas accumulations in the Beaufort-Mackenzie Basin. The evaluated wells include Tuk M-18, Kurk M-15, Paktoa C-60, Olivier H-01, Langley E-07 and K-30 (Langley field), Ellice I-48 and J-27 (Ellice field), Umiak N-05 and N-16 (Umiak field). Petrophysical models are developed for the evaluation of reservoir properties, including lithology, porosity, permeability and water saturation using core-calibrated log data. Potential oil and gas zones are identified using specified porosity and water saturation cut-off values (>10% porosity, <45% Sw).

Most of the log-identified petroleum zones in the ten wells occur primarily in the Paleogene Taglu and Aklak sequences in sandstone reservoirs of good porosity and permeability, or in shaly sandstone and siltstone reservoirs with fair to good porosity and permeability. However, major identified gas zones in the Tuk gas field occur in sandstone of the Lower Cretaceous Kamik Formation. Good quality gas zones in the Tuk M-18 well occur in fine to mediumgrained sandstone with good porosity (21% on average), excellent permeability (mainly between 10 and 2000 mD), and high gas saturation (90% on average), and with restricted flow test rates up to 860,000 cubic meter of natural gas per day. In the Paktoa C-60 well, the only significant discovery drilled in the Beaufort Sea since 1990, an oil zone is identified in unconsolidated fine to coarse-grained sandstone of the Taglu Sequence. This zone has good reservoir properties with an average porosity of 25% and maximum permeability of 10 to 100 mD. This log interpretation is consistent with drill stem tests that recovered oil from this interval.

INTRODUCTION

The Beaufort-Mackenzie Basin contains large volumes of discovered oil and natural gas resources and has significant resource potential for future discoveries. The first discovery well, Atkinson H-25, was drilled in the Mackenzie Delta in 1969 and recovered oil, prompting an initial phase of exploration. Offshore drilling in the Beaufort Sea started in 1973 and led to an oil and gas discovery at the Adgo F-28 well in March 1974. Up to 1998, over 250 wells had been drilled, and 53 significant crude oil and gas discoveries had been made, including 20 gas, 13 oil and 20 oil and gas wells (Fig.1), which were estimated to have $161 \times 10^6 \text{ m}^3$ (1.01 billion barrels) of recoverable oil and 255 x 10^9 m^3 (9 Tcf) of marketable gas (National Energy Board, 1998). In 1998, the Ikhil J-35 well was drilled in the Ikhil field which entered production in July 1999 to supply natural gas to the local communities in Inuvik.

Since 2000, more than 25 new petroleum exploration wells have been drilled, resulting in ten significant conventional hydrocarbon discoveries that include the following wells: Tuk M-18, Kurk M-15, Paktoa C-60, Olivier H-01, Langley E-07 and K-30 (Langley field), Ellice I-48 and J-27 (Ellice field), Umiak N-05 and N-16 (Umiak field) (Fig.1 Devon and Petro-Canada, 2002; Chevron Texaco, 2003; Oil&Gas Journal, 2007; Hogg et al., 2009; MGM Energy Corp., 2008, 2009; Drummond, 2009; NEB, 2007, 2009, 2013; Northern Oil and Gas Branch, 2009, 2010). In total, 64 significant conventional oil and gas discoveries had been made in the Beaufort-Mackenzie Basin by 2010, among which 54 were made by 1999, and 10 since 2000. Most discovered petroleum resources occur within the Cretaceous to Pleistocene stratigraphic successions and the others occur in Paleozoic carbonates (Fig. 2, modified from Dixon et al., 1994, 2007).

The Geological Survey of Canada (GSC) has evaluated the petroleum resource potential for the Beaufort-Mackenzie Basin. Estimates of the total discovered conventional resources (mean values) are 277.3 x 10⁶ m³ (1.744 billion barrels) of recoverable oil and 332.4 x 10^9 m³ (11.74 Tcf) of recoverable natural gas (Dixon et al., 1994). In 2007 the discovered recoverable oil (mean value) was estimated to be 327 x 10^6 m³ (2.1 billion barrels) (Chen et al., 2007). Basin-wide appraisals indicate high potential for undiscovered conventional oil and gas (Dixon et al., 1994; Osadetz et al., 2005; Chen et al., 2007). However, no oil and gas resource estimates in conventional reservoirs are publicly available that include the ten recent discoveries since 2000.

This petrophysical study integrates geophysical log data and core analyses for the ten discovery wells; nine of these penetrated Pliocene to Eocene strata; whereas Tuk M-18 well encountered Pliocene to Cretaceous successions (Table 1). The primary objectives are to determine reservoir properties including lithology, porosity, permeability and water saturation, as well as possible hydrocarbon zones, providing key reservoir parameters for further petroleum resource assessments and basin studies.



QUAT.	HOLOCENE		SHALLOW BAY				* depth uncertain										
	PLEISTOCENE				ΝΙΙΚΤΔΚ		Company	Devon and Petro-Canada		Devon Canada	Chev BP (ron Texaco & anada Energy		EnCana, Anadarko & ConocoPhillips		MGM Energy Corporation	
TERTIARY	PLIOCENE	IPERK			Νοιτιάκ		Well	KURK M-15	TUK M-18	PAKTOA C-60	LANGLEY K-30	ELLICE	OLIVIER H-01	UMIAK N-16	UMIAK N-05	LANGLEY E-07	ELLICE J-27
							Fm. / Seq.	(2001)	(2001)	(2005-2006)	(2003)	(2004)	(2004-2005)	(2004)	(2005)	(2008)	(2009)
	MIOCENE	AKPAK					Iperk	9.4	9.8	52.3	5.3	9.7	9.7	11.9	9.5	6.2	7.1
		MACKENZIE BAY		☆	MACKENZIE BAY	*	Mackenzie Bay			506							
	OLIGOCENE	KUGMALLIT		*	KUGMALLIT	*	Kugmallit			643	200	270*	219	237	245		260*
							Richards			987	309 (286)	510	742	1938.5	1950	503	572
	EOCENE			*		<u> </u>	Taglu	342		1248	533 (458)	2083 (2077)	1764.5 (1722.9)	2818	2863.4 (2800.7)	593	990 (971.5)
			RICHARDS		RICHARDS	* 8	Aklak	2700 (2699)	245			2464 (2453)					1764.4 (1686.4)
			· · · ·		REINDEER		Fish River										
		EINDEER	TAGLU	LU 🔆		*	Mason River		2044								
	PALEOCENE		ΔΚΙ ΔΚ	*		*	Smoking Hills		2332 (2326.3)								
					MOOSE CHANNEL	*	Mount Goodenough		2380 (2373.8)								
CRETACEOUS	UPPER	FISH RIVER		*	TENT ISLAND		Kamik		2643 (2624)								
		SMOKING HILLS			MASON RIVER		McGuire		2739.4 (2718.2)								
		BOUNDARY CREEK			BOUNDARY CREEK		Martin Creek		2762 (2728)								
		NO NAMED SEQUENCES BELOW BOUNDARY CREEK Source rock ● Oil discovery ☆ Gas discovery ★ Oil and Gas discovery					Husky		2792 (2769.6)								
							Total Depth (MD)	3093	2966	2382	1390	3806	3480.5	3101	3549.4	1355	2102
	LOWER				MOUNT GOODENOUGH POINT		Total Depth (TVD)	3091.8	2933.7	2365.1	1222.3	3751.2	3431.5	3100.8	3437.3	1355	1999.4
					KAMIK ☆ McGUIRE PARS MARTIN CREEK ☆	SONS OUP	Figure Cretac (modif	2. Strat eous to ied fron	igraphic Pleistoce 1 Dixon o	chart, pote ene stratigr <i>et al.</i> , 1994	ential rese aphic suc 4, 2007).	rvoirs an cessions	d source 1 of the Bea	cocks occu aufort-Ma	urring with the second	hin the Basin	

SEQUENCI

FORMATION

Figure 1. Significant conventional discovery wells in the Beaufort-Mackenzie Basin (modified from Dixon, 1996; NEB, 1998).

Table 1. Stratigraphic tops and total drilled depths (metres below KB)

for the ten wells evaluated in this study

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AGE

K. Hu¹, Z. Chen¹, and D.R. Issler¹

Tuk M-18

Tuk M-18 well was drilled by Devon Canada Corporation to a total depth of 2966 m. and was spudded on December 24th, 2001. The well penetrated the Iperk and Aklak sequences, and the Mason River, Smoking Hills, Mount Goodenough, Kamik, McGuire, and Martin Creek formations, and it terminated within the Husky Formation. The primary targets of the well were the potential gas reservoirs in the Cretaceous Kamik sandstone and the shallower Tertiary Aklak section.

Calibrated by core analysis results (Fig. 3), petrophysical parameters are calculated and potential gas zones are identified primarily for the fine to medium-grained sandstone with interbedded siltstone of the Kamik Formation. From log analysis, the effective porosity values predominantly vary from 15 to 20% with the maximum > 25%. The calculated permeability values are mainly between 10 and 2000 mD, showing a similar range to those from core analysis results (Fig. 4). In the identified gas zones, water saturations are very low with indications of significant invasion by resistivity logs. Density-neutron porosity crossover occurs in most of the gas zones, with large separation between Sxo and Sw. Gas peaks also occur in the mud gas log. A laminated siltstone reservoir identified within the Martin Creek Formation has average porosity and permeability values of approximately 11% and 2 mD, respectively, with minor net pay, DST#1 (2681 - 2701.37 m TVD) indicates that the gas rate is 586 x 10³ m³/d during the cleanup period, and 290 x 10³ m³/d for the main flow period; for DST#2 (2643.2 - 2649.02 m TVD), the final gas rate is 860 x 10^3 m³/d for the cleanup period and 422×10^3 m³/d during the main flow period, supporting the well log interpretation (Fig.4).



20%, with the same peak value. However, big differences are observed in core permeability values between the two groups, which range mainly from 10 to >1000 mD for Kamik Formation, and from 0.01 to 10 mD for Aklak Sequence and Martin Creek Formation. from Aklak Sequence and Martin Creek Formation (one circled shale sample is excluded). N: total number of core samples. N1: total



Kurk M-15

Kurk M-15 well, located approximately 150 km north-northwest of Inuvik, was drilled vertically to a final total depth of 3093 metres by Petro-Canada and Devon Canada Corporation (formerly Anderson Exploration Ltd.) in February of 2001. It penetrated the Iperk Taglu and Aklak sequences. The principal objective of this exploratory well was to evaluate potential gas reserves held in the Taglu Sequence; a secondary objective was the Aklak Sequence. The Kurk M-15 well was reported as a significant discovery (NEB, 2009, 2013 Northern Oil and Gas Branch, 2010).

Figure 5 presents well logs, a gas log, calculated petrophysical parameters, and identified possible hydrocarbon zones. From log analyses results and sample descriptions, the interpreted conventional hydrocarbon zones occur mainly in three intervals. Interval #1 (1342-1554 m) is in the lower Middle Taglu Sequence and includes fine to medium-grained sandstone reservoirs with average values of 22% porosity and 100 mD permeability that decrease at greater depth to 18% porosity and 20 mD permeability in very fine to fine-graine sandstones. Interval #2 (1588.5-1898.6 m) contains very fine to fine-grained sandstone i the top of the Lower Taglu Sequence with an average porosity of 19% and a permeability range mainly from 10 to 100 mD. MDT tests indicate several zones with gas shows, supporting the log analysis results. Interval #3 (2700-2876 m) contains interbedded very fine to fine-grained sandstones with hydrocarbons in the Aklak Sequence that have lower average porosity (15%) and permeability (\sim 10 mD) but higher total gas in mud.



Umiak Field

The Umiak field lies onshore in the Mackenzie Delta portion of the Beaufort-Mackenzie Basin (Fig. 1). A partnership of EnCana, Anadarko and ConocoPhillips drilled the Umiak N-16 well in 2004 which led to the discovery of oil and gas in Eocene Taglu shoreface and delta front sands (Hogg et al., 2009). In 2005 the extent of the Umiak field was confirmed by the Umiak N-05 appraisal well. Together these two wells have delineated the fourth largest onshore gas accumulation on the Mackenzie Delta. NEB declared the two wells as significant discoveries (NEB, 2007, 2009, 2013). Core porosity and maximum permeability distributions from Taglu samples of the two wells are illustrated in Figure 6.

Umiak N-16 well was drilled in the Burnt Lake area in 2004 to a total depth of 3101 m. The well penetrated the Iperk, Kugmallit, Richards, and Taglu sequences; the main objective was to test the gas potential of the Taglu Sequence, and the Lower Richards Sequence. Log analysis indicates that possible gas zones occur from the top to lower section of the Taglu Sequence, which consists mainly of very fine to fine, and fine to coarse-grained sandstone, interbedded with siltstone and coal beds. The sandstones can be slightly dolomitic, partly with chert, and with minor carbonaceous material and pyrite (Datalog Canada Ltd., 2004). The identified gas reservoirs show 10 to 20% porosity and calculated permeability values are mainly from 20 to 200 mD. From thin section petrographic analysis (at depth of 2829.5 m), microporosity associated with kaolinite may affect effective porosity and reduce permeability (Core Laborateries, 2004). Three clean up/flow tests were performed, confirming two gas production zones (Fig. 7), supporting the log analysis results.

Umiak N-05 well was drilled about 2 km SE of the Umiak N-16 well in 2005 to a total depth of 3549 m, and it penetrated the Iperk, Kugmallit, Richards and Taglu sequences. The well targeted reservoirs in the Tertiary-aged lower Richards and Taglu Sequences on the Umiak structural anticline, and it is a significant discovery (NEB, 2007, 2009, 2013). From log analysis, possible hydrocarbon reservoirs are identified in both the lower Richards and Taglu sequences. The lower Richards sandstones are generally very fine to medium-graine and contain chert and quartz with occasional feldspar (Datalog Canada Ltd., 2005). The Richards sandstone reservoirs range from 10% to 25% in porosity, and 20 to 1000 mD in permeability. Taglu sandstones are typically very fine to medium-grained with occasional coarser intervals. The sands are composed of chert and quartz grains with occasional feldspar grains and sedimentary rock fragments. Log analysis indicates that three hydrocarbon zones occur in the Taglu Sequence. In the upper and middle potential hydrocarbon zones, most porosity values are between 10 and 18%, and their permeability values range from 20-200 mD. The log- calculated hydrocarbon saturations may be lower than real values in some intervals due to poor borehole conditions. Gas and oil were recovered in two DSTs, supporting the log interpretations. The lower hydrocarbon zone in the Taglu Sequence shows better reservoir quality, with an average porosity of 18% and a wide permeability range mainly from 20 to 2000 mD, similar to the core measurements (Fig. 8).



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PETROPHYSICAL CHARACTERISTICS OF POST-2000 SIGNIFICANT CONVENTIONAL DISCOVERY WELLS IN THE BEAUFORT-MACKENZIE BASIN

RESERVOIR EVALUATION

Paktoa C-60

Paktoa C-60 well is the only offshore well drilled in the Beaufort-Mackenzie Basir since 1990. It was drilled by Devon Canada Corporation in 2005-06 to a total depth of 2382 m (2365 m TVD), and is located 31 km NW of Garry Island, and 180 km NW of Inuvik (Fig. 1). The well penetrated the Iperk, Mackenzie Bay, Kugmallit, Richards, and Taglu sequences. The primary objective of this well was to evaluate the hydrocarbon potential of the Taglu Sequence in the Paktoa structure; the secondary objective was to evaluate the shallower Kugmallit Sequence. The Paktoa C-60 well was declared as a significant discovery in the Beaufort Sea with 38 x 10⁶ m³ of recoverable oil (240 million barrels) (Oil&gas Journal, 2007; NEB, 2009; Drummond, 2009).

Log analysis results indicate that the identified main reservoir in the Upper Taglu Sequence consists predominantly of unconsolidated fine to coarse-grained sandstone and siltstone with minor carbonaceous minerals. Well testing DST#4 indicates oil was recovered at a flow rate of 190 m³ per day. Fig. 9 illustrates a composite plot, consisting of well log data and petrophysical analysis results for the well.



Olivier Field

Olivier H-01, Olivier 2H-01 and Olivier 3H-01 wells were drilled by Chevron Texaco with partner BP Energy Canada in the Mackenzie Delta near the edge of the Beaufort-Sea during 2004 and 2005. The objective of the wells was to evaluate the Taglu sandstones to determine the presence of hydrocarbons. The Olivier H-01 well was declared as a significant discovery (NEB, 2009, 2013).

The reservoir characteristics in Olivier H-01 well are evaluated based on core analysis data from the second-leg well Olivier 2H-01 and detailed petrophysical analyses of wireline well logs. Log analyses results indicate that possible hydrocarbon reservoirs occur in the top of Taglu Sequence, which mainly consists of very fine to coarse-grained sandstones. For the identified possible reservoir zones in the Olivier H 01 well, calculated porosity and permeability range predominantly from 15 to 25%, and 1 to 500 mD, respectively, showing similar trends to the core measurements in the Olivier 2H-01 well (Fig. 10). Fig. 11 illustrates well logs, calculated petrophysical parameters, and interpreted possible hydrocarbon zones for the Olivier H-01 well. DST#1 shows that 687 x 10^3 m³ of gas was produced per day, supporting the well log interpretations.



Ellice I-48 well was drilled by Chevron Canada Resources in 2004 to a total depth of 3806 m (3751 m TVD), and was completed and tested in 2005. The well is located or Ellice Island in the Mackenzie Delta and mainly targeted the Aklak and Taglu sequences. In 2009, NEB confirmed the significant discovery (NEB, 2009). Potential hydrocarbon zones are interpreted from log analysis in Taglu sandstones characterized by good porosity (22% on average) and permeability (~120 mD on average). For DST#2, the maximum gas to surface is 950 x 10³ m³ per day, and 52.23 m³ of condensate was recovered. Fig. 12 illustrates well logs and mud gas log, calculated porosity, permeability and water saturation, and identified potential gas zones, as well as production test results for the Taglu Sequence. No hydrocarbon potential is identified for the Aklak Sequence

Ellice J-27 well was drilled by MGM Energy Corporation to a depth of 2102 m (1999.4 m TVD) from December of 2008 to January of 2009. The well penetrated the Iperk, Kugmallit, Richards, Taglu and Aklak sequences, and was perforated and tested in both the Aklak and Taglu sequences, yielding gas and demonstrating a significant discovery in Mackenzie Delta (NEB, 2009, 2013), with a contingent resource estimate of 9.3 x 10⁹ m³ of natural gas (Northern Oil and Gas Branch, 2009). Log analysis results indicate four possible hydrocarbon zones. One gas zone occurs in the Taglu medium-grained sandstone characterized by 20% average porosity and 70 mD average permeability. Three potential gas zones mainly occur in the fine to medium-grained sandstones within the Aklak Sequence, with average porosity of 16 to 20% and permeability of 10 to 200 mD, and high gas saturation (80% in average). The production tests indicate that the Aklak gas zone and Taglu gas zone flowed at a maximum rate of 1083 x 10³ m³/d and 632 x 10³ m³/d, respectively. Fig. 13 shows combined well logs and calculated petrophysical parameters, mud gas log, and production test results.



identified in the Taglu Sequence (upper panel) and Aklak Sequence (lower panel).

Langley K-30 well was drilled by Chevron Canada Resources in 2003 to a total depth of 1390 m (1222.3 m TVD) in the Mackenzie Delta on the edge of the Beaufort Sea, and it penetrated the Iperk, Richards and Taglu sequences. The main target of the well was the Taglu Sequence. Chevron Canada reported that the Langley K-30 well had encountered commercial quantities of natural gas (Chevron Texaco, 2003; Daily Oil Bulletin, 2003). NEB declared it a significant discovery (NEB, 2007, 2009, 2013). Gas zones are identified from log analysis in shallow part of the Taglu Sequence. The reservoir section consists predominantly of fine to coarse-grained sandstone and grey claystone, with quartz, chert and lithic grains (Datalog Canada Ltd., 2003). Log analysis results indicate that the average porosity is about 25%, estimated permeability values range mainly from 100 to 1000 mD, and the average water saturation is < 20%. Gas peaks on the mud gas log and a production test with 508 x 10³ m³ of gas per day support log interpretations. Fig. 14 shows a composite plot, consisting of well logs, calculated petrophysical parameters, interpreted lithology and potential hydrocarbon zones, as well production results

well production test result.



contribution number: 20070247

27-well-tsx-mgx-939503.htm well-tsx-mgx-946943.htm

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Ellice Field

Correlation
Depth
Porosity Logs
Resistivity
Porosity
Water Saturation
Permeability
Mud Gas Logs
Lithology
Possible
Hest Result

Seq.

 <u>GR</u>
 <u>O</u>
 <u>API</u>
 <u>200</u>
 <u>SP</u>
 <u>O</u>
 <u>mvin</u>
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 <u>M2R2</u>
 <u>PHID-PHIN</u>
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 O</u>
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Langley Field

Langley E-07, a vertical well, was drilled by MGM Energy Corporation during the 2007-2008 winter program in the Mackenzie Delta, with a total depth of 1355 m. The Langley E-07 well penetrated the Iperk, Richards and Taglu sequences, and it is located approximately 15 km southeast of the existing Langley K-30 discovery. The primary target of the well was the Taglu Sequence. MGM Energy Corporation announced the discovery (MGM Energy Corp., 2008). A possible gas reservoir is identified in the Taglu sandstone from log analysis and it has over 30% of porosity, over 1000 mD of permeability, and 30% of water saturation on average. The well test result indicates that gas was recovered at restricted flow rates of 388 x 10³ m³/d on a 2-inch choke (MGM Energy Corp., 2008). Fig. 15 illustrates well logs, calculated petrophysical parameters, a gas log and a

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REFERENCES

- Chen, Z., Osadetz, K., Dixon, J., Morrell, G., and Dietrich, J.R., 2007. The future oil discovery potential of the Mackenzie/Beaufort Province. AAPG Annual Convention, Long Beach, California, April 1-4, 2007. National Resources Canada ESS
- Daily Oil Bulletin, 2003. Chevron reports North Langley K-30 gas discovery. April 25, 2003. https://www.dailyoilbulletin.com/headlines/2003-04-25/ Chevron Texaco, 2003. Chevron Canada makes gas discovery at Mackenzie Delta, April 24, 2003. Rigzone, April 2003. https://www.rigzone.com/news/oil gas/a/6406/ Core Laborateries, 2004. Petrographic study of sidewall core samples for EnCana Corporation Umiak N-16 well, Mackenzie Delta. May 2004, File 52135-04-3259.
- Datalog Canada Ltd., 2003. Final well report for Chevron et al. Langley K-30, March 2003, p16. Datalog Canada Ltd., 2004. End of well report for EnCana Corporation, EnCana et al. Umiak N-16, Mackenzie Delta, NWT, p48-50.
- Datalog Canada Ltd., 2005. End of well report for EnCada Corporation Umiak N-05, April, 2005. Devon and Petro-Canada, 2002. Devon, Petro-Canada boost Canada's Arctic hopes with Delta gas find. Petroleum News, v. 8, no. 44, April 23, 2002. http://www.petroleumnews.com/newsbulletin/878177904.htm
- Dixon, J., Morrow, D.W., and MacLean B.C., 2007. A guide to the hydrocarbon potential of the northern mainland of Canada. Geological Survey of Canada, Open File 5641, 46 p. Dixon, J. (Editor), 1996, Geological Atlas of the Beaufort-Mackenzie Area: Geological Survey of Canada Miscellaneous Report 59.
- Dixon, J., Morrell, G.R., Dietrich, J.R., Taylor, G.C., Procter, R.M., Conn, R.F., Dallaire, S.M., and Christie, J.A., 1994. Petroleum resources of the Mackenzie Delta and Beaufort Sea. Geological Survey of Canada, Bulletin 474, 52 p. Drummond K.J. 2009. Northern Canada Distribution of Ultimate Oil and Gas Resources. Prepared for Northern Oil and Gas Branch. Indian and Northern Affairs Canada, March 2009, 60 p.
- http://www.drummondconsulting.com/NCAN09Report.pdf Hogg, J., Prost, G. and Cody. J., 2009. The Umiak Discovery, Northwest Territories, Canada. Abstract, 2009 CSPG CSEG CWLS Convention, Calgary, Alberta.
- MGM Energy Corporation, 2008. MGM et al Langley E-7 Final Well Report, June 10, 2008. MGM Energy Corporation, 2008. Langley E-07 discovery. Marketwired, April 07, 2008. http://www.marketwired.com/press-release/mgm-energy-corp-langley-e-07-discovery-tsx-mgx-840642.htm
- MGM Energy Corporation, 2009. MGM Energy Corp. announces natural gas discovery in Ellice J-27 well. Marketwired, January 20, 2009. http://www.marketwired.com/press-release/mgm-energy-corp-announces-natural-gas-discovery-in-ellice-j-MGM Energy Corporation, 2009. MGM Energy Corp. announces results of first test of Ellice J-27 well. Marketwired, February, 08, 2009. http://www.marketwired.com/press-release/mgm-energy-corp-announces-results-of-first-test-of-ellice-j-27-
- NEB (National Energy Board), 1998. Probabilistic Estimate of Hydrocarbon Volumes in the Mackenzie Delta and Beaufort Sea Discoveries. January 1998. Cat. No. NE23-78/1998E.
- NEB (National Energy Board), 2007. 2006 Annual Report to Parliament, March 20, 2007, p22. http://publications.gc.ca/collections/collection 2007/neb-one/NE1-2006E.pdf NEB (National Energy Board), 2009. Table of significant and commercial discovery declarations. August 31, 2009.
- NEB (National Energy Board), 2013. Table of significant and commercial discovery declarations (Updated 2 May 2013). May 2, 2013. https://www.neb-one.gc.ca/nrth/dscvr/tbscdd-eng.xls Northern Oil and Gas Branch, 2009. Archived - Northern oil and gas annual report 2008. https://www.aadnc-aandc.gc.ca/eng/1100100037185/1100100037199
- Northern Oil and Gas Branch, 2010. Archived Northern oil and gas annual report 2009. http://www.aadnc-aandc.gc.ca/eng/1100100036906/1100100036920 Oil&Gas Journal, 2007. Devon's Paktoa a giant Beaufort oil find. October 26, 2007. https://www.ogj.com/articles/2007/10/devons-paktoa-a-giant-beaufort-oil-find.html
- Osadetz, K.G., Morrel, G.R., Dixon, J., Dietrich, J.R., Snowdon, L., Dallimore, S., and Majorowicz, J., 2005. Beaufort-Mackenzie Basin: A review of conventional and non-conventional (gas hydrate) petroleum reserves and undiscovered resources. in Scientific Results from the Mallik 2002 Gas Hydrate Production Research Well Program, Mackenzie Delta, Northwest Territories, Canada. Dallimore, S. R. and Collett, T. S. (eds.). Geological Survey of Canada, Bulletin 585, 19 p.