ILLUSTRATION 12

9230-V2-1P

GEOLOGY
OF THE
H. B. CAMERON HILLS A-05 AND NEARBY GAS DISCOVERIES

MIDDLE DEVONIAN CARBONATE BARRIER COMPLEX
GREAT SLAVE PLAIN
NORTHWEST TERRITORIES

DISCOVERY DATE : 1968

PREPARED BY
VEEZAT GEODATA (1977) LIMITED PARTNERSHIP
CALGARY, ALBERTA
1982

REGIONAL LOCATION MAP

1982 MACKENZIE BASIN CANADA LANDS EXPLORATION PROGRAM

WELL DATA SUMMARY
of
INITIAL DISCOVERY WELL
H. B. CAMERON A-05

LOCATION: Lat. 60° 24' 03.14" N. Long. 117° 38' 27.44" W. Great Slave Plain, N.W.T.

ELEVATION: KB: 2,556' (779.1M) GL: 2,543' (775.1)

SPUDDED: January 28, 1968

COMPLETED: February 24, 1968

STATUS: Suspended Gas Well

TOTAL DEPTH: 4,969' (1,514.6M)

LOG RUN: Borehole-Compensated Sonic (BHC-S), Gamma Ray Neutron (GRN), Electrical Induction (IES), Formation Density (FD), Sidewall Neutron Porosity (SNP)

CORED INTERVAL: 4663'-4703' (1354.2m-1372.5m) 4802'-4823' (1402.7m-1410.3m) 4875'-4908' (1485.9m-1496.0m) 4909'-4949; (1496.3m-1508.5m) cores available

DRILLSTEM TESTS: 1. 4379'-4443' (1334.7m-1354.2m) (Slave Point) GTS in 3 min., maximum gas flow of 2.0 mmcf/d (5.66 x 10^3 m^3/d)

2. 4572'-4602' (1393.5m-1402.7m) (Watt Mountain Sulphur Point) GTS in 3 min., at maximum gas flow of 1.0 mmcf/d (28.3 10^3 m^3/d) Rec. 20' (9.1m) sulphurous water.

3. 4845'-4875' (1476.8m-1485.9m) (Hunkeg, Keg River) GTS in 4 min., maximum gas flow 1.0 mmcf/d (28.2 10^3 m^3/d) Rec. 15' (4.6m) sulphurous gas cut mud

4. 4873'-4903' (1485.2m-1494.4m) misrun.

5. 4876'-4909' (1483.5m-1496.0m) (Keg River) GTS in 3 min., at maximum gas flow of .500 mmcf/d (14.1 10^3 m^3/d) Rec. 110' (33.5) sulphurous gas cut mud.

RESERVOIR DATA

HYDROCARBON BEARING SECTION: Slave Point Fm. of Middle Devonian age.

RESERVOIR ROCK: Fossiliferous medium crystalline limestone.

TRAP TYPE: A combined stratigraphic/structural trap localized along an inferred northeasterly trending fault.

POTENTIAL PRODUCTIVE INTERVAL: 1333.8m - 1350m (4375'-4430')

NET GAS PAY THICKNESS: 5.2m (17')

POROSITY: 8%

DRILLSTEM TEST MAXIMUM FLOW RATE: 5.6 10^3 m^3/d (2.0 mmcf/d)

GAS CHARACTERISTICS:

		(Volume Percentage)	
Oxygen	.00	Propane	.70
Helium	.05	Isobutane	.11
Nitrogen	2.03	N-Butane	.21
Carbon Dioxide	1.39	Isopentane	.07
Hydrogen Sulphide	1.14	N-Pentane	.07
Methane	92.52	Hexane	.08
Ethane	1.58	Hexane Plus	.06

Gross BTU/ft^3 at 60° F. and 14.65 psia = 1008.4 BTU/ft^3

Gross Joules/m^3 at 15.5° C. and 101.01 k.p.a. = 3.76 x 10^6 K Joules/m^3

Specific Gravity .610 (measured) .609 (calculated).

STRUCTURAL GEOLOGY
of the
CAMERON HILLS GAS DISCOVERY
GREAT SLAVE PLAIN

The Great Slave Plain is situated in the southern Mackenzie Basin and is underlain by the Middle Devonian carbonate barrier complex. This physiographic and structural province lies between the Canadian Shield on the east and the Cordilleran area on the west. Bedrock consists of mainly Cretaceous and Upper Devonian clastics, and the plain is surrounded by isolated erosional remnants of Cretaceous sandstones. Regionally, Paleozoic strata dip gently westward at the rate of 3m/km to the Liard Hinge Line where the rate of dip of the sediments increases to 20 m/km to the west.

One of the major structural elements of this area is an extensive early Paleozoic, westerly trending paleotopographic structural high referred to as the Tathlina Arch or High. The initial structural movements of this feature began no later than the Caledonian orogeny (late Silurian to early Devonian time) but may date from Precambrian time as earlier Paleozoic sediments (Silurian, Ordovician and Cambrian) have been removed by pre-Devonian erosion. During and following emplacement of the Tathlina Uplift, the Paleozoic was eroded and any early Paleozoic rocks that may have been present were removed. Middle and Lower Devonian carbonates and evaporites were deposited around and over the flanks of the Tathlina Arch and covered the crest of it by late Middle Devonian time. Thus, Middle Devonian strata onlapped and buried this broad paleotopographic structural feature.

Subsequent Paleozoic orogenic movements such as the Variscan orogeny (late Devonian) and the Hercynian orogeny (late Pennsylvanian to early Permian) probably had little effect on the Tathlina Arch as Upper Devonian strata are relatively undisturbed across this structural element. Minor folds and flexures occurred during these later orogenies along with renewed movement along Caledonian and Precambrian fault and flexure zones.

A second, northeasterly trending structural pattern is evident throughout this area of the Middle Devonian carbonate barrier complex. This structural trend is apparent at the surface as northeasterly trending normal and high angle reverse faults and as distinctive alignments and lineaments, some of which extend from the Canadian Shield southwesterly to the Cordilleran Region. In the subsurface, evidence from borehole and seismic data also identifies these dislocations. This structural pattern is directly related to northeasterly trending Precambrian fault and flexure zones which were reactivated throughout subsequent periods of tectonism. These structural zones of weakness were reactivated many times during the Paleozoic and particularly during the Laramide orogeny of late Cretaceous-early Tertiary age. Evidence of post-Laramide movement is apparent in the offsetting of Laramide structures in the Liard Plateau to the west and to a lesser degree in the Great Slave Plain. The northeasterly trending structural fabric present in the Middle Devonian carbonate barrier complex plays an important part in hydrocarbon entrapment. Laramide structures provide traps and in addition reservoir characteristics are enhanced through fracture porosity.

The Cameron Hills structure contains the northeasterly alignment of basement faults and flexures which occur throughout the Middle Devonian carbonate barrier complex. These basement controlled faults are depicted as high angle normal faults which in this area have little or no surface expression. Dominant structural elements are three faults believed to be responsible for paleotopographic highs on the Precambrian. Support for this interpretation of Precambrian positive areas comes from thinning in the Keg River and Sulphur Point formations in wells. The Slave Point Formation shows little thickness change here suggesting that the effects of basement irregularities were minimal at this stratigraphic level. The position of the fault on the structural map is adapted from de Wit et al (1971) and their locations have been generalized. The fault blocks are all portrayed as upthrown on the southeast. Displacement along these faults varies between 10 m and 60 m. Recurring structural movement along these faults has been documented elsewhere in the area, including post Middle Devonian activity. The faults are believed to have played a major role in localizing hydrocarbons. Some of these faults are believed to have been in place prior to hydrocarbon migration, as witnessed by the recovery of water from wells in structurally higher positions than the gas reservoir in the discovery well. Detailed mapping of the position and time of movement of these faults through seismic methods could lead to other promising exploration targets.

WELL DATA SUMMARY
of
PARAMOUNT H.B. et al CAMERON J-62
(Sulphur Point Formation discovery)

LOCATION: Lat. 60° 21' 15" N., Long. 117° 25' 50" W.

ELEVATION: KB: 2477' (755M) GL: 2463' (751.3M)

SPUDDED: February 7, 1980

COMPLETED: March 11, 1980

STATUS: Suspended gas well

TOTAL DEPTH: 5266' (1605m) in Precambrian

LOGS RUN: Gamma Ray Neutron (GRN)

CORED INTERVAL: No cores cut

DRILLSTEM TESTS: 1. 4931'-4953' (1515m-1522m) (Keg River) no GTS. Rec. 164' (50m) mud, 377' (115m) sulphurous saltwater, 3035' (925m) gas cut sulphurous water.

2. 4538'-4577' (1383m-1395m) (Sulphur Point) GTS in 2 min., at maximum flow of 2.4 mmcf/d (68.0 10^3 m^3/d) no Rec.

3. 4328'-4423' (1319m-1348m) (Slave Point) no GTS. Rec. 90' (28m) water, 131' (40m) drilling mud, 328' (100m) mud cut saltwater.

4. 5127'-4235' Misrun.

RESERVOIR DATA

HYDROCARBON BEARING SECTION: Sulphur Point Formation of Middle Devonian age.

RESERVOIR ROCK: Finely crystalline pelletoidal limestone with very fine to finely crystalline dolomite.

TRAP TYPE: A combined stratigraphic/structural trap localized along a northeasterly trending fault.

POTENTIAL PRODUCTIVE INTERVAL: 1379m-1393m (4526'-4577')

NET GAS PAY THICKNESS: (52.5') 16 m

POROSITY: 6%

DRILLSTEM TEST MAXIMUM FLOW RATE: 68.9 10^3 m^3/d (2.4 mmcf/d)

No other information available.

WELL DATA SUMMARY
of
PARAMOUNT H.B. et al CAMERON HILLS H-31
(Keg River Formation Discovery)

LOCATION: Lat. 60° 26' 55.97" Long. 117° 07' 22.30" Great Slave Plain

ELEVATION: KB: 1,158' (352.8m) GL: 1,146' (354.7m)

SPUDDED: March 9, 1979

COMPLETED: March 26, 1979

STATUS: Suspended Gas Well

TOTAL DEPTH: 3,478' (1060m) in basal clastics

LOGS RUN: Dual Induction Focused Log (DIFL), Borehole-Compensated Sonic (BHCS), Compensated Neutron Formation Density Log (CNL-FDC).

CORED INTERVAL: No core cut

DRILLSTEM TESTS: 1. 3271'-3310' (997m-1012m) (Keg River) GTS immediately, at maximum gas flow 1.36 mmcf/d (35.2 10^3 m^3/d) Rec. 272' (83m) oil, 248' (76m) oil cut water, 181' (55m) mud.

2. 2684'-2937' (817m-895m) Sulphur Point (Nahanni) GTS in 1 min., at maximum gas flow 127 mmcf/d (6.1 10^3 m^3/d) Rec. some as DST #1.

3. 2883'-2924' (878m-891m) (Fort Vermilion, Watt Mountain, Sulphur Point). TSTM Rec. none as DST #1.

4. 2984'-3021' (909m-920m) (Sulphur Point, Nahanni) GTS in 4 min. at maximum gas flow 152 mmcf/d (4.2 10^3 m^3/d) Rec. 155' (28m) mud.

5. 2812'-2871' (856m-875m) (Fort Vermilion, Watt Mountain, Sulphur Point), Rec. 310' (95m) gas cut drilling mud, 248' (75m) heavy black gassy mud, 6.6°(28m) drilling mud.

6. 2527'-2726' (813m-826m) (Slave Point) GTS at 11 mmcf/d (284 m^3/d).

7. 2812'-2871' (772m-816m) (Upper Devonian shales, Slave Point) no GTS.

8. 2812'-2871' (772m-816m) (Upper Devonian shales, Slave Point) no GTS. Rec. 187' (57m) water, 272' (83m) drilling fluid.

RESERVOIR DATA

HYDROCARBON BEARING SECTION: Keg River Formation of Middle Devonian age.

RESERVOIR ROCK: Microcrystalline dolomite.

TRAP TYPE: A combined stratigraphic/structural trap localized along a northeasterly trending fault.

POTENTIAL PRODUCTIVE INTERVAL: 847m-1013m (2771'-3324')

NET GAS PAY THICKNESS: 16m (53')

POROSITY: 1%

DRILLSTEM TEST MAXIMUM FLOW RATE: 35.2 10^3 m^3/d (1.24 mmcf/d)

GAS CHARACTERISTICS:

		(Volume Percentage)	
Oxygen	.00	Propane	2.56
Helium	.04	Isobutane	.65
Nitrogen	1.20	N-Butane	1.27
Carbon Dioxide	.00	Isopentane	.35
Hydrogen Sulphide	.00	N-Pentane	.35
Methane	88.83	Hexane	.36
Ethane	3.51	Octane	.15
		Nonane	.01
		Decane	trace

Total 100.00%

SELECTED BIBLIOGRAPHY

BASSETT, D.G. and J.G. STOUT, 1967, Devonian of Western Canada in International Symposium on the Devonian System, Calgary, Alberta, D.H. Oswald ed.: Calg. Int. Petrol. Geol., v. 1, p. 717-752.

BELYEA, H.R., 1972, Middle Devonian tectonic history of the Tathlina Uplift, Northwestern District of Mackenzie and northern Alberta, Canada: Geol. Surv. Can., Paper 70-24.

BELYEA, H.R. and A.W. NORRIS, 1962, Middle Devonian and Paleozoic formations of northwest District of Mackenzie and adjacent areas: Geol. Surv. Can., Paper 62-15.

BRADY, W.A., 1961, Upper Devonian coranond fauna of Great Slave Lake and northeastern Alberta, Canada in International Symposium on the Devonian System, D.H. Oswald, ed.: Calg. Int. Petrol. Geol., v. 2, p. 617-631.

BRAUN W.K. and F. LOVSUNDE, 1982, A new late Devonian ostracode fauna and its bearing on the Frasnian-Famennian boundary in Western Canada: Can. Jour. Earth Sciences, v. 19, no. 12, p. 2453-2461.

BRIGGINS, W.M. et al, 1971, Geophysical and geochemical determinations from the subsurface of Devonian reefs in Franklin and Mackenzie and the Yukon Territory: Geol. Surv. Can., Paper 70-18.

CAMERON, A.R., 1968, Regional geochemical study of the Slave Point carbonates, northern Canada: Can. Jour. Earth Sciences, v. 5, no. 4, p. 247-262.

CAMPBELL, N.A., 1971, Stratigraphy and structure of Pine Point area, Northwest Territories in Structural Geology of Canadian Ore Deposits, v. 2: Sixth Commonwealth Mining and Metallurgical Congress, Canada.

CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS, 1961, Lexicon of Canadian Stratigraphy, Volume 2, Yukon Territory and District of Mackenzie: C.S.P.G., Calgary.

de WIT, R., E.C. GRONDMAN, W.S. RICHARDS and W.D. RICHARDS, 1971, Tathlina area District of Mackenzie: In The Future Petroleum Provinces of Canada, R.G. McCrossan, ed.: Can. Soc. Petrol. Geol., Memoir 1.

DOUGLAS, R.J.W., 1959, Great Slave and Great Bear Rivers, Mackenzie, Northwest Territories: Geol. Surv. Can., Paper 58-3.

DOUGLAS, R.J.W. and A.W. NORRIS, 1960, Hare River map area, N.W.T.: Geol. Surv. Can., Paper 60-7.

FULLER, J.G.C.M. and E.W. WINKLER, 1972, Early exposures of Middle Devonian reefs, Jean River, Northwest Territories, Canada in International Geological Congress, 24th Session, Section 6, Stratigraphy and Sedimentology, Montreal, 1972, J.G. Gill, ed.: International Geological Congress.

GRAYSTON, L.D., G.P. GLENNIE and J.F. ALLAN, 1968, Middle Devonian, in Geological History of Western Canada, R.G. McCrossan and R.P. Glaister, eds.: Alta. Soc. Petrol. Geol., p. 49-79.

GRIFFITH, D.H., 1981, The Devonian Slave Point, Boyerchill Lake, and Nahanni Formations of northeastern British Columbia and adjacent areas: British Columbia Department of Mines and Petroleum Resources, Bulletin 63, 70 p.

GUTTERS, P.R. and R.C. HILDRED-GROSS, 1977, Devonian coal in the subsurface of Northeastern Alberta: Geological Association for Oil and Gas: Geol. Surv. Can., Paper 77-1A, Report of Activities, p. 147-150.

KLINGSPOR, A.P., 1969, Middle Devonian Muskeg evaporites of Western Canada: Alta. Soc. Petrol. Geol., Bull. v. 32, no. 4, p. 327-348.

LAW, J., 1971, Regional Devonian geology and oil and gas possibilities, upper Mackenzie River area: Bull. Can. Petrol. Geol., v. 19, no. 3, p. 437-488.

LEES, A.F., 1962, Correlation in Devonian sea-level changes in western and northern Canada: Can. Jour. Earth Sciences, v. 19, no. 10, p. 1910-1932.

McCAVOY, J.E. and L.D. SKRIPTUN, 1967, Middle Devonian facies relationships, Zama area, Alberta: Bull. Can. Petrol. Geol., v. 15, no. 4, p. 434-457.

McHUGH, A.M., 1973, The Presqu'ile complex-implications for Middle Devonian paleogeography of northern Alberta and British Columbia: Bull. Can. Petrol. Geol., v. 21, no. 4.

MORLEY, J.A.A. and R.D. TURNCOCK, 1973, Facies relations at edge of early mid-Devonian carbonate barrier complex, Cameron Hills area, N.W.T.: Bull. Canadian Geology: Geol. Assoc. Petrol. Geol., Tulsa 18.

NORFORD, B.S. et al, 1970, Biostratigraphic determinations of fossils from the subsurface of the Yukon Territory and the Districts of Mackenzie and Franklin: Geol. Surv. Can., Paper 70-15.

NORFORD, B.S. et al, 1972, Biostratigraphic determinations of fossils from the subsurface of the Yukon Territory and the Districts of Franklin, Keewatin and Mackenzie: Geol. Surv. Can., Paper 72-26.

NORRIS, A.W., 1965, Stratigraphy of Middle Devonian and older Paleozoic rocks of the Great Bear Lake region, Northwest Territories: Geol. Surv. Canada, Memoir 339.

RAASCH, G. and ASSOCIATES, 1971, Slave Point datum project, Phases I, II and III: Geol. Surv. Canada, Open File 89A, 89T and 89B.

RICHARDS, W.D., 1971, Paleoecologic stratigraphy and sedimentation of the Slave Point Formation, southern Northwest Territories and northern Alberta: Unpublished D.Sc. thesis, Stanford University.

SEALL, R., 1972, The paleoenvironment of the Pine Point lead-zinc districts: Econ. Geol., v. 70, no. 1, p. 32-47.

SEALL, R., 1977, The geology of the Pine Point Barrier Reef complex in The Geology of Selected Carbonate Oil, Gas and Lead-Zinc Reservoirs in Western Canada, Fifth Core Conference, Calgary, Alberta, L.A.McCleath and R.D. Harrison, ed.: Can. Soc. Petrol. Geol.

SEMOTUK, J.C. and ASSOCIATES, 1972, Report on summer geological program, H. Dodd Design Project, N.W.T.

VEZEAY, J.D., 1977, Reports on the Great Slave-Great Bear Lakes area, Northwest Territories: Veezay Geodata Ltd., Open File Reports, Canadian Oil and Gas Land Administration, Calgary, Alberta.

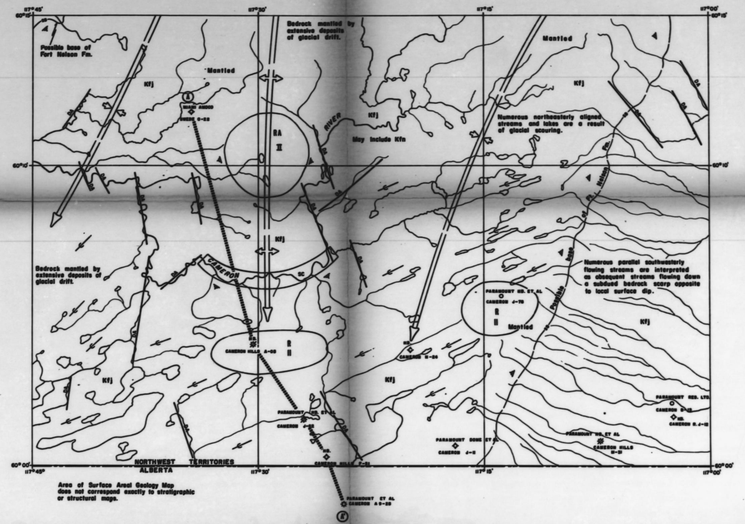
WILLIAMS, G.D., 1972, Devico platform dolomite OWR 5A, 5D, 8A, 10D, 10E: District of Mackenzie: Geol. Surv. Can., Paper 72-30, Report of Activities, p. 31-35.

WILLIAMS, G.D., 1977, The Caribou structure compared with other basement structures on the flanks of the Tathlina High, District of Mackenzie: Geol. Surv. Can., Paper 77-1B, Report of Activities, p. 301-302.

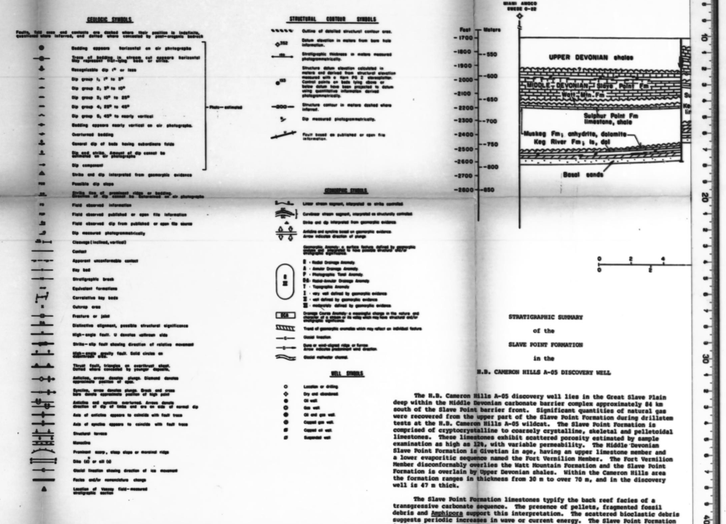
WILLIAMS, G.D., 1981, Middle Devonian barrier complex of western Canada: Geol. Surv. Can., Open File Report 761.

SURFACE AREAL GEOLOGY AND STRUCTURAL INTERPRETATION MAP
OF THE
HB CAMERON HILLS A-05 GAS DISCOVERY
IN THE
GREAT SLAVE PLAIN

SCALE 1:100,000



LEGEND



STRATIGRAPHIC SUMMARY
of the
SLAVE POINT FORMATION
in the
H.B. CAMERON HILLS A-05 DISCOVERY WELL

The H.B. Cameron Hills A-05 discovery well lies in the Great Slave Plain deep within the Middle Devonian carbonate barrier complex approximately 84 km south of the Slave Point barrier front. Significant quantities of natural gas were recovered from the upper part of the Slave Point Formation during drillstem tests at the H.B. Cameron Hills A-05 wellbore. The Slave Point Formation is comprised of cryptocrystalline to coarsely crystalline, skeletal and pelletoidal limestones. These limestones exhibit scattered porosity estimated by sample examination as high as 12%, with variable permeability. The Middle Devonian Slave Point Formation is Givetian in age, having an upper limestone member and a lower evaporitic sequence named the Fort Vermilion Member. The Fort Vermilion Member disconformably overlies the Watt Mountain Formation and the Slave Point Formation is overlain by Upper Devonian shales. Within the Cameron Hills area the formation ranges in thickness from 30 m to over 70 m, and in the discovery well is 47 m thick.

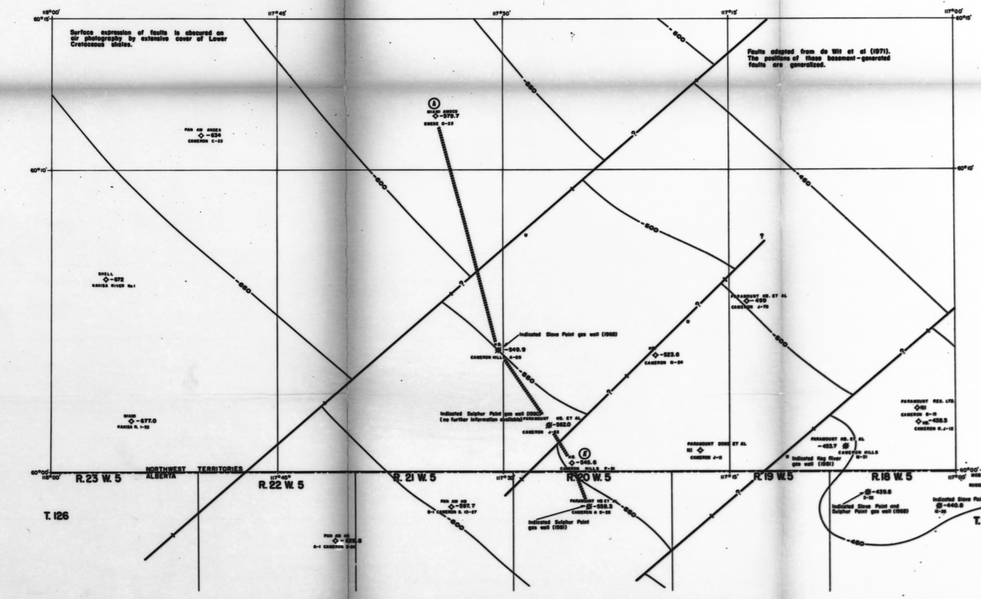
The Slave Point Formation limestones typify the back reef facies of a transgressive carbonate sequence. The presence of pellets, fragmented fossil debris and Amphipora support this interpretation. The scattered bioclastic debris suggests periodic increases in wave or current energy. The Slave Point Formation in the discovery well is divided between the upper limestones (30.2m thick) and the Fort Vermilion (16.8m thick). Drillstem tests yielded a maximum gas flow at 56,600 m^3 (2.0 mmcf/d). Porosity shown on the logs is 5-2 m and is scattered within the upper 21 m of the Slave Point Formation. Zonation of the porosity as shown on the geological strip log and combined stratigraphic/structural cross section was determined by sample and well log examination. Significant gas recoveries from the Keg River and Sulphur Point Formations in the discovery well were also recorded. Both formations consist of dolomite which is everywhere to medium crystalline and which exhibits scattered, vuggy and intercrystalline porosity. From sample examination, porosity was estimated as high as 12%. Drillstem tests yielded up to 28,300 m^3 (1.0 mmcf/d) of natural gas from the Keg River and Sulphur Point Formations.

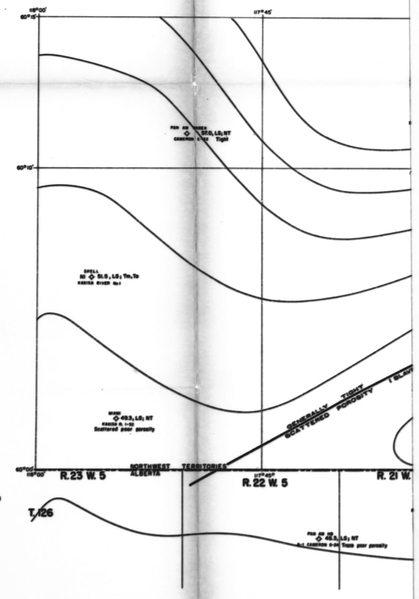
Possible source beds are shales of the Middle Devonian Horn River and Keg River formations. Faulting played a significant role in localizing hydrocarbon accumulation. Hydrocarbon traps are interpreted as resulting from a combination of stratigraphic and structural elements. Similar to the Rabbit Lake, Collaera and Tathlina accumulations, hydrocarbon migration in Cameron Hills was restricted by faults which were in place. To illustrate this point, in the H.B. Cameron Hills F-51 well, the Sulphur Point Formation is structurally higher than in the Paramount H.B. et al Cameron J-62 well, yet only 170 m of muddy salt water was recovered. In the J-62 well 68,000 m^3 (2.4 mmcf/d) of gas were recovered from the Sulphur Point. These faults are part of a series of northeasterly trending basement-controlled faults and flexures developed throughout the Great Slave Plain. Subtle stratigraphic traps due to permeability barriers or porosity and pressure changes within the limestones may be present. From the stratigraphic map, Keg River and Sulphur Point Formations "thins" were found to be the result of limited deposition over paleotopographic highs on the Precambrian and probably recurring structural movements which may have created distinctive subsidence. By Slave Point time they were no longer an influence. The presence of other hydrocarbon accumulations in combined stratigraphic/structural subtle stratigraphic trapping circumstances can be anticipated in the Cameron Hills area.

STRUCTURAL MAP OF THE SLAVE POINT FORMATION OF MIDDLE DEVONIAN AGE
IN THE CAMERON HILLS AREA

STRUCTURAL DATUM: TOP OF THE SLAVE POINT FORMATION
MIDDLE DEVONIAN AGE

CONTOUR INTERVAL : 50 METERS SCALE 1:100,000

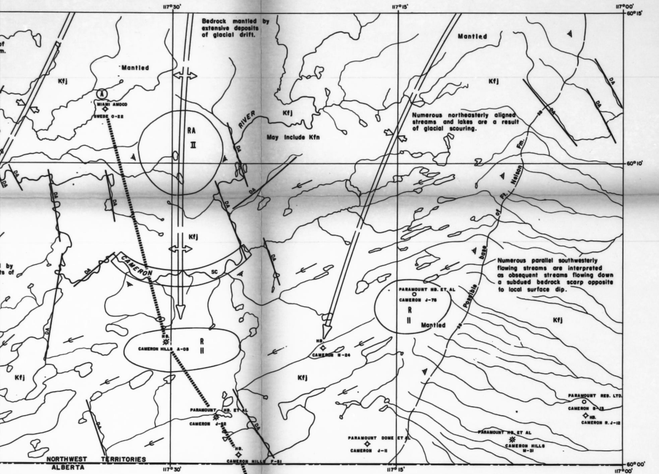




2000 Walkley Rd. Ottawa, Ont.
Canada K1G 3P7
Tel (613) 731-9571
Telex: 053-3502 Cable: TERRA PROJ. NO. 9230-V2-1P LINE NO. W A
PART NO. 1 OF 2 R.R. 10X

SURFACE AREAL GEOLOGY AND STRUCTURAL INTERPRETATION MAP OF THE HB CAMERON HILLS A-05 GAS DISCOVERY IN THE GREAT SLAVE PLAIN

SCALE 1:100,000



Surface Areal Geology Map correspond exactly to stratigraphic ral maps.

LEGEND

AGE	SYMBOL	FORMATION
LOWER CRETACEOUS	Kfj	Fort St. John Gp; Sh May include Upper Cretaceous Fort Nelson Fm. Ss.

GEOLOGIC SYMBOLS

STRUCTURAL CONTOUR SYMBOLS

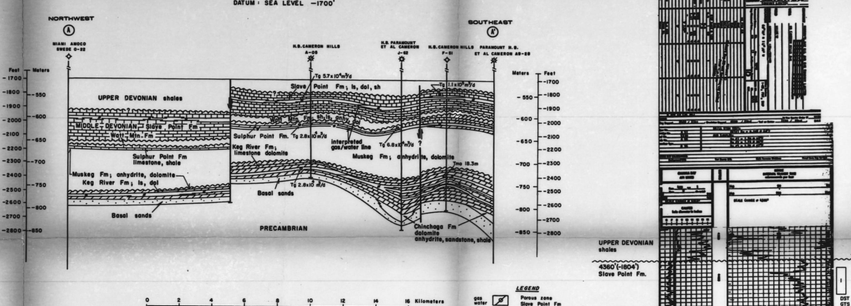
GEOMORPHIC SYMBOLS

WELL SYMBOLS

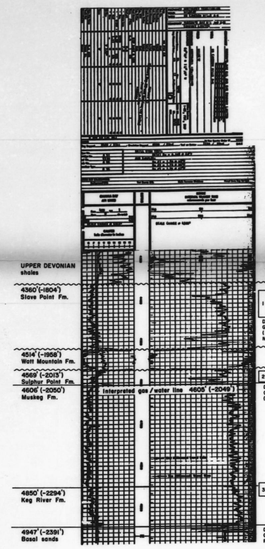
WELL INFORMATION AS OF MARCH, 1983.

DIAGRAMMATIC STRUCTURAL AND STRATIGRAPHIC CROSS-SECTION ACROSS CAMERON HILLS

HORIZONTAL SCALE 1:100,000
VERTICAL SCALE 1:3600
VERTICAL EXAGGERATION X27.8
DATUM: SEA LEVEL -1700'



STRATIGRAPHIC SUMMARY of the SLAVE POINT FORMATION in the H.B. CAMERON HILLS A-05 DISCOVERY WELL



VEEZAY STRIP LOG

Well:
Location:
Elevation:
Completed:
Status:
Total depth:
Interval examined:

DESCRIPTION

STRATIGRAPHIC MAP OF THE SLAVE POINT FORMATION OF MIDDLE DEVONIAN AGE

STRATIGRAPHIC MAP OF THE SULPHUR POINT FORMATION OF MIDDLE DEVONIAN AGE

STRATIGRAPHIC MAP OF THE KEG RIVER FORMATION OF MIDDLE DEVONIAN AGE

The H.B. Cameron Hills A-05 discovery well lies in the Great Slave Plain deep within the Middle Devonian carbonate barrier complex approximately 84 km south of the Slave Point barrier front. Significant quantities of natural gas were recovered from the upper part of the Slave Point Formation during drillstem tests at the H.B. Cameron Hills A-05 wildcat. The Slave Point Formation is comprised of cryptocrystalline to coarsely crystalline, skeletal and pelletoidal limestones. These limestones exhibit scattered porosity estimated by sample examination as high as 12%, with variable permeability. The Middle Devonian Slave Point Formation is Givetian in age, having an upper limestone member and a lower evaporitic sequence named the Fort Vermilion Member. The Fort Vermilion Member disconformably overlies the Watt Mountain Formation and the Slave Point Formation is overlain by Upper Devonian shales. Within the Cameron Hills area the formation ranges in thickness from 30 m to over 70 m, and in the discovery well is 47 m thick.

The Slave Point Formation limestones typify the back reef facies of a transgressive carbonate sequence. The presence of pellets, fragmented fossil debris and Amphipora support this interpretation. The scattered bioclastic debris suggests periodic increases in wave or current energy. The Slave Point Formation in the discovery well is divided between the upper limestones (30.2m thick) and the Fort Vermilion (16.8 m thick). Drillstem tests yielded a maximum gas flow at 56,600 m^3 (2.0 mmcf/d). The net pay shown on the logs is 5.2 m and is scattered within the upper 21 m of the Slave Point Formation. Zonation of the porosity as shown on the geological strip log and combined stratigraphic/structural cross section was determined by sample and well log examinations. Significant gas recoveries from the Keg River and Sulphur Point formations in the discovery well were also recorded. Both formations consist of dolomite which is very fine to medium crystalline and which exhibits scattered, vuggy and intercrystalline porosity. From sample examination, porosity was estimated as high as 12%. Drillstem tests yielded up to 28,300 m^3 (1.0 mmcf/d) of natural gas from the Keg River and Sulphur Point Formations.

Possible source beds are shales of the Middle Devonian Horn River and Keg River formations. Faulting played a significant role in localizing hydrocarbon accumulation. Hydrocarbon traps are interpreted as resulting from a combination of stratigraphic and structural elements. Similar to the Rabbit Lake, Calibeta and Yathlinn accumulations, hydrocarbon migration in Cameron Hills was restricted by faults which were in place. To illustrate this point, in the H.B. Cameron Hills P-51 well, the Sulphur Point Formation is structurally higher than in the Paramount H.B. et al Cameron J-62 well, yet only 170 m of muddy salt water was recovered. In the J-62 well 68,000 m^3 (2.4 mmcf/d) of gas were recovered from the Sulphur Point. These faults are part of a series of northeasterly trending basement-controlled faults and flexures developed throughout the Great Slave Plain. Subtle stratigraphic traps due to permeability barriers or porosity or facies change within the limestones may exist as well. From the stratigraphic map, Keg River and Sulphur Point Formations "thins" are interpreted to be the result of limited deposition over paleotopographic highs on the Precambrian surface, probably removing structural movements which may have created differential subsidence. By Slave Point time they were no longer an influence. The prospect of other hydrocarbon accumulations in combined stratigraphic/structural or subtle stratigraphic trapping circumstances can be anticipated in the Cameron Hills area.

STRATIGRAPHIC LEGEND

- Normal fault, u indicates upthrown side.
- Facies change
- Unconformity
- Isopach contours in meters.
- Geologic cross section.

WELL SYMBOLS

- 280 — Thickness in meters of unit completely penetrated in well.
- 280+ — Unit not completely penetrated; minimum thickness indicated.
- 300e — Estimated thickness in meters
- 0 — Unit absent because of nondeposition or erosion.
- NI — Information not available, incomplete or not examined
- NR — Unit not reached.

SAMPLE CONTROL STATION

Thickness of Slave Point Fm.
DOMINANT + secondary lithologies
69.5 LS, ds; Tm — Drillstem test results
Fair porosity
porosity grade

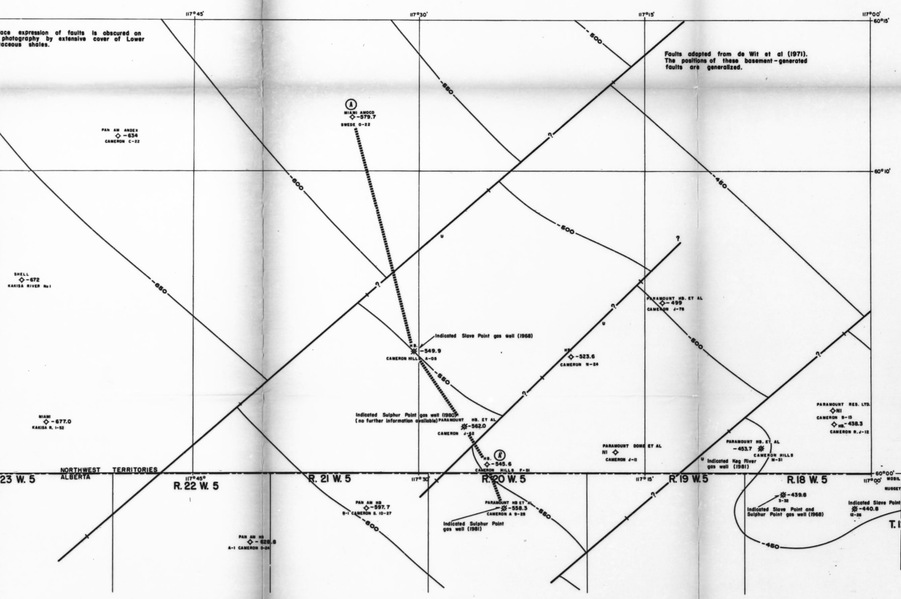
DRILLSTEM TEST ABBREVIATIONS

T	Tested
f	fresh
g	gas, gassy, gas-cut
m	mud, muddy
o	oil, oily, oil-cut
cond	condensate
w	water, watery, water-cut
s	salt, salty, (incl. brackish).
NT	Well was not tested.
NAT	Not adequately tested
NATm	Not adequately tested due to minrun

STRUCTURAL MAP OF THE SLAVE POINT FORMATION OF MIDDLE DEVONIAN AGE IN THE CAMERON HILLS AREA

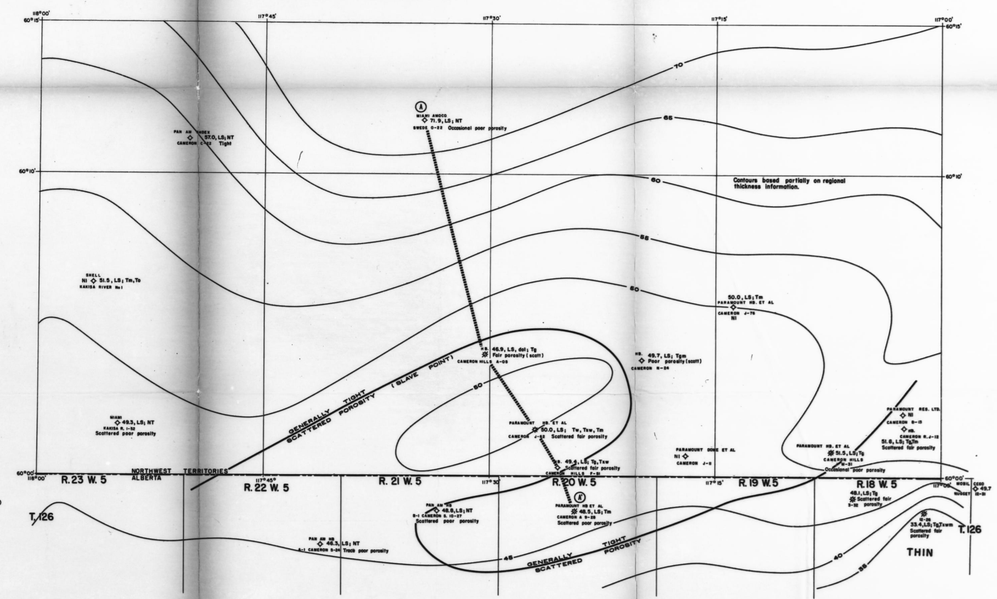
STRUCTURAL DATUM: TOP OF THE SLAVE POINT FORMATION OF MIDDLE DEVONIAN AGE

CONTOUR INTERVAL: 50 METERS SCALE 1:100,000



STRATIGRAPHIC MAP OF THE SLAVE POINT FORMATION OF MIDDLE DEVONIAN AGE

ISOPACH INTERVAL: 5 METERS SCALE 1:100,000



2080 Valley Rd. Ottawa, Ont.
Tel (613) 731-9671
Telex: 053-3502 Cable: TERRA
PROJ. NO. 9230-V2-1P
LINE NO. MA
PART NO. 2 OF 2
R.R. 10X