ILLUSTRATION 4 B

STRATIGRAPHY

9230-V2-1P

# GEOLOGY OF THE WESTERN MINERALS CHANCE YT N° 1 OIL AND GAS DISCOVERY

## SOUTHEASTERN EAGLE PLAIN YUKON TERRITORY

DISCOVERY DATE · 1960

PREPARED BY

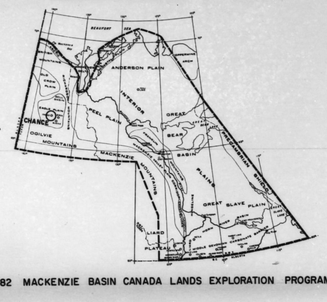
**VEEZAT GEODATA (1977) LIMITED PARTNERSHIP**

CALGARY, ALBERTA

1982

SEE ILLUSTRATION 4A FOR WESTERN MINERALS CHANCE YT No 1 STRUCTURAL ANALYSIS.

REGIONAL LOCATION MAP



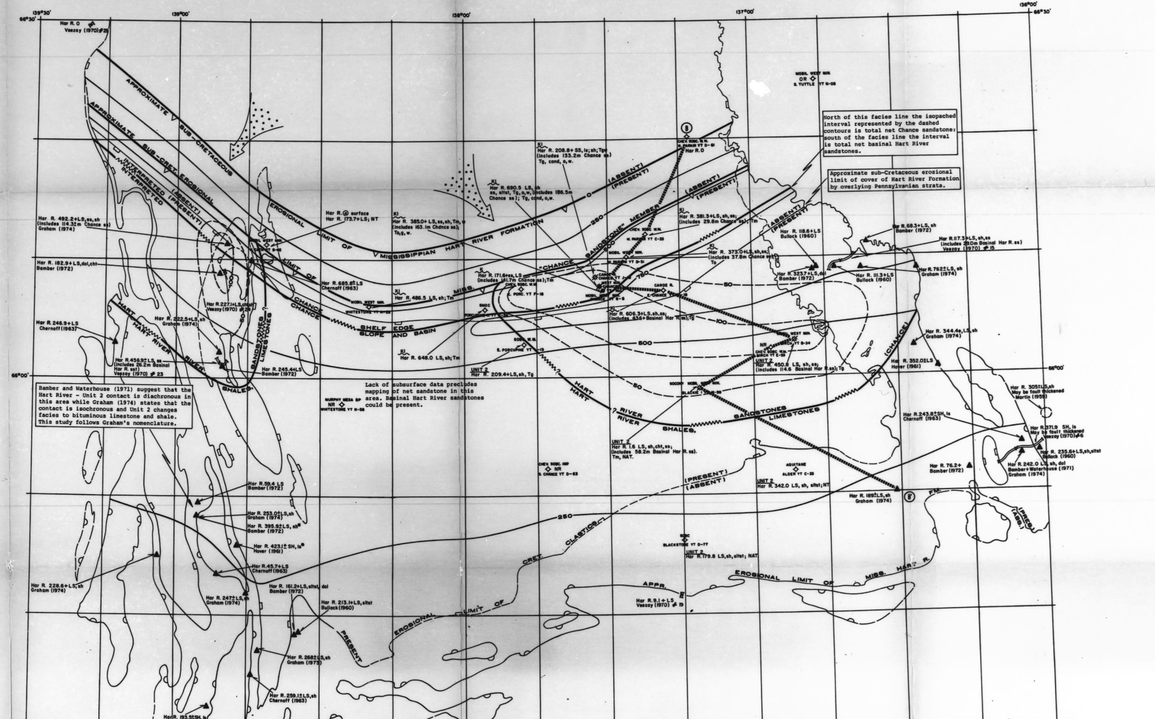

1982 MACKENZIE BASIN CANADA LANDS EXPLORATION PROGRAM

## STRATIGRAPHIC MAP OF THE HART RIVER FORMATION OF MISSISSIPPIAN AGE SOUTHERN EAGLE PLAIN

TOTAL FORMATION ISOPACH INTERVAL · 250 METERS (SOLID CONTOURS) CHANCE SANDSTONE AND TOTAL NET BASINAL SANDSTONE ISOPACH INTERVAL · 50 METERS (DASHED CONTOURS)

SCALE · 1: 250,000

This map shows the interpreted thickness, distribution, lithology and significant stratigraphic changes prior to Laramide deformation and subsequent erosion.




## LEGEND

- Major thrust fault, triangles on overthrust sheet.
- Normal fault; solid circles on downthrown side.
- Depositional or erosional limit of stratigraphic unit prior to burial by overlying strata.
- Present or sub-Tertiary erosional outcrop limit of stratigraphic unit; omitted or generalized in areas of complex outcrop patterns.
- Limit of cover by younger rocks; generalized or omitted in areas of complex outcrop patterns.
- Nomenclature change.
- Facies change.
- Unconformity.
- 100 Isopach contours in meters.
- A — A' Geologic cross section.
- Stratigraphic section field-measured by Veezat.
- Stratigraphic thickness calculated photogeologically or photogrammetrically.
- Published or open-file stratigraphic section measured or observed in field.
- Geographic origin of stratigraphic data indefinite.
- Nah 500 Five hundred meters of Nahanni Formation.
- Gss 0+ Gossage Formation present; no thickness reported.
- (f) Tectonic thickening or thinning (faulted).
- 0 Formation absent due to nondeposition or erosion prior to burial by overlying strata.
- Stratigraphic section measurement from published source showing approximate line of traverse.
- Indicates unreliable thickness due to exaggerated dip-to-dip, suspected faulting or controlled or questionable stratigraphic interpretation of data. Wavy intersection of true thickness is indicated by telephone.
- x Thickness estimated.
- of Overturned
- Smith (1978) Direction of transport of terrigenous clastics.
- Published reference, see bibliography of report.

## WELL SYMBOLS

- 280 Thickness in meters of unit completely penetrated in well.
- 260+ Unit not completely penetrated; minimum thickness indicated.
- 300 Estimated thickness in meters.
- 320± Thickness in excess of unit, interpretive due to insufficient information or obscure boundary relationships.
- [234] Thickness in meters from source other than petrophysical log.
- 0 Unit absent because of nondeposition or erosion.
- OR Older rocks at the surface.
- NI Information not available, incomplete or not examined.
- NR Unit not reached.
- Well location or drilling well.
- Standing well.
- Water injection, thermal observation, etc.
- Dry and abandoned test.
- Oil well.
- Abandoned oil well.
- Capped or suspended oil well (shut-in).
- Gas well.
- Abandoned gas well.
- Capped or suspended gas well (shut-in).
- Oil and gas well.
- Abandoned oil and gas well (shut-in).
- Capped or suspended oil and gas well (shut-in).
- surface — bottom of hole Directionally drilled or deviated well.

## 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 mirum.

## SAMPLE CONTROL STATIONS

### SURFACE

Thickness of Hart River Formation in meters — Thickness of Chance sandstone member in meters.

Graham (1974) reference source — Hor R 482.2 L.S., sh, ss (includes 14.32 m Chance ss). DOMINANT or secondary lithologies

### SUBSURFACE

Age of strata — Thickness of Hart River Formation in meters — Thickness of Chance sandstone member in meters.

Uniform of contacts — 690.5 L.S., sh, ss; ≈1741; DOMINANT or secondary lithologies

$Tg_1$, $s_w$ (includes 180.2m Chance ss); $Tg_1$ cond, s, w. — Drillstem test results

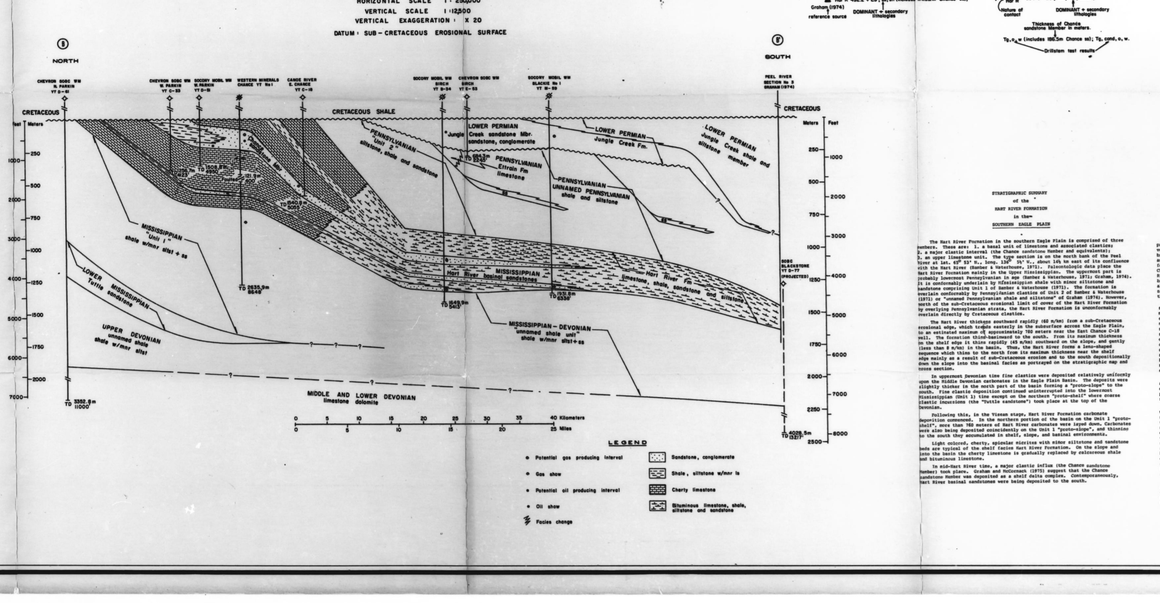
## STRATIGRAPHIC CROSS SECTION B-B'

HORIZONTAL SCALE 1: 250,000

VERTICAL SCALE 1: 12,500

VERTICAL EXAGGERATION · X 20

DATUM · SUB-CRETACEOUS EROSIONAL SURFACE




### LEGEND

- Potential gas producing interval
- Gas show
- Potential oil producing interval
- Oil show
- Facies change
- Sandstone, conglomerate
- Shale, siltstone w/minor ls
- Cherty limestone
- Bituminous limestone, shale, siltstone and sandstone

## STRATIGRAPHIC SUMMARY of the HART RIVER FORMATION in the SOUTHERN EAGLE PLAIN

The Hart River Formation in the southern Eagle Plain is comprised of three members. These are: 1. a basal unit of limestone and associated clastics; 2. a major clastic interval (the Chance sandstone member and equivalents); 3. an upper limestone unit. The type section is on the north bank of the Peel River at Hart River (Graham & Cecile, 1972). The Hart River Formation is conformable with the Hart River Member (Graham & Cecile, 1972). Paleontologic data place the Hart River Formation entirely in the Upper Mississippian. The uppermost part is conformable with the overlying Lower Permian Jungle Creek Formation (Graham, 1974), probably lowermost Permian in age. Unfossiliferous shale with minor siltstone and ss is conformably underlying the Mississippian shale with minor siltstone and sandstone (Graham's Unit 1 of Member 4 Waterhouse (1971). The formation is overlain conformably by Pennsylvanian clastics of Unit 2 of Member 4 Waterhouse (1971) or "unnamed Pennsylvanian shale and siltstone" of Graham (1974). However, in the southern Eagle Plain the Hart River Formation is unconformably overlain by overlying Pennsylvanian strata. The Hart River Formation is unconformably overlain directly by Cretaceous clastics.

The Hart river stratigraphy southward rapidly (62 m/mi) from a sub-Cretaceous erosional edge, which trends easterly in the subsurface across the Eagle Plain, to a maximum thickness of approximately 1000 m in the Chance N-14 well, 20 mi. south. The formation thins southward to the south. From its maximum thickness in the shelf edge it thins rapidly (45 m/mi) southward on the slope, and gently (less than 8 m/mi) on the basin floor. The Chance sandstone member thins southward from 180 m to 0 m. The south from its maximum thickness near the shelf edge rapidly as a result of sub-Cretaceous erosion and to the south depositionally down the slope into the basinal facies as portrayed on the stratigraphic map and cross section.

In epeneric Devonian time fine clastics were deposited relatively uniformly over the Middle Devonian carbonates in the Eagle Plain Basin. The deposits were thin and continuous in the north part of the basin forming a "proto-slope" to the shelf. Fine clastic deposition continued uninterrupted into the lowermost Mississippian (Unit 1) time except on the northern "proto-shelf" where coarse clastic sediments (the "Little sandstone") took place at the top of the Devonian.

Following this, in the Tournai stage, Hart River Formation carbonate deposition commenced. In the northern portion of the basin on the Unit 1 "proto-shelf", more than 180 meters of Hart River carbonates were laid down. Carbonates were deposited on the shelf and upper slope. Fine clastic deposition continue in the south they accumulated in shelf, slope, and basinal environments.

Light colored, cherty, spicular siltstone with minor siltstone and sandstone beds are typical of the shelf facies Hart River Formation. On the slope and into the basin the cherty limestone is gradually replaced by calcareous shale and bituminous limestone.

In mid-Hart River time, a major clastic influx (the Chance sandstone member) was deposited on the shelf and prograded into the basin. The Chance sandstone member was deposited as a shelf wedge. Contemporaneously, Hart River basinal sandstones were being deposited to the south.

The shelf facies Chance sandstone is characteristically conglomeratic in part, with light to dark brown sand-sorted chert clasts in a light brown-gray sandy matrix. Interbedded with the coarse clastics are medium to light brown-gray siltstones and bituminous siltstone, dark brown to black calcareous shale and light to medium brown eiertic limestone are also present. The shelf-facies Chance sandstone and equivalents rest on the Upper Chance unit (Member No. 1, Chance 0-18, and Chance 0-19). On the adjacent slope and basin, basinal Hart River sandstones are underlain by Hart River Formation limestones. These basinal sands are typically of similar composition to the Chance sandstone although much thinner and less continuous laterally. One of these basinal sandstones is quartzitic and quartzitic in origin, in the reservoir rock in the Ninda N-66 successful well.

The distribution of the Chance sandstone and its basinal equivalents are shown on the accompanying map and cross section. In the northeastern part of the map area the Chance sandstone thickness rapidly (25 m/mi) from its northeast limit of deposition to a minimum thickness of 20 m in the Chance N-14 well, 20 mi. south. The Chance N-14 well,the line equivalent basinal sandstones thin to the south inherits their further edge where they change facies to shales and limestones. The presence of the Chance sandstone and its equivalents in the Chance N-14 well, 20 mi. south, is interpreted as being due to a Middle Devonian paleohigh and quartz component coming from the Ogilvie Mountains Devonian quartzites and quartzites. The flank of the structurally positive Eagle Arch, in the central part of the map area, the Chance sandstone and basinal Hart River sandstones appear to have undergone a facies change to shale and limestone and are not present in the southern part of the map area. Consequently the Chance and sandstone in the south-central map area where basinal Hart River sandstones could be present.

The Chance sandstone and its basinal Hart River sandstone equivalents are a complex series of lentincular deltaic,shelf, slope and basinal turbidite sandstones. Although the Chance sandstone is a major oil and gas producer, potentially prospective are fractured Hart River limestones beneath the Chance sandstone, as shown by gas shows in Chance N-14 from 3125 m to 3160 m.

The accompanying structural cross section between oil and gas discovery wells along the Chance anticline attempts to illustrate the local complex structural and stratigraphic relationships between the Chance and Hart River sandstone reservoirs. Apparently the hydrocarbon accumulations are a complex series of oil and gas entrapments which are controlled not only by local facies changes but also local porosity and permeability development within the Chance sandstone in addition to structure of the Chance anticline. This resulted in numerous oil and gas shows in the Chance sandstone and underlying Hart River strata. Detailed examination of sample sets of the porosity and permeability seems to be related to secondary calcite cement and backfilled plugging pores. Some of the porosity and permeability in the Chance sandstone and Hart River sandstone reserve zones in the Chance discovery well could involve Hart River shales and limestones, it is also possible the unconformably overlying Cretaceous shales served as source beds.

From a regional stratigraphic basin the prospective areas for Hart River sandstone reservoirs are the shelf edge and slope sandstone facies and the development where in the stratigraphic map and along the slope and in the Hart River basin at the base of the slope where basinal Hart River sandstones accumulated.

## WELL DATA SUMMARY of CHANCE YT-N-1 OIL AND GAS DISCOVERY

### WELL DATA PURPOSE of WESTERN MINERALS CHANCE YT No. 1

### WELL SYNOPSIS

LOCATION: Lat. 66° 21' 41.955" N. (66.12948° N. Lat.) Long. 137° 21' 27.322" W. (137.5247° W. Long.) Southern Eagle Plain, Yukon Territory.

ELEVATION: KB: 1748' (532.9m) Gla: 1727' (526.8m)

SPUDDED: Sep 30, 1959 (59-05-30)

COMPLETED: Sep 25, 1960 (60-05-25)

STATUS: Shut-in gas & oil wells Chance sandstone Member of Fleming-Upper Hart.

TOTAL DEPTH: 8484' (2635.9m) in Mississippian-Devonian L.

LOGS RUN: Electrical Log (ES), Sonic Log (S), Formation Tester Log (DST), Microlog-Caliper (MLC), Temperature (TEMP).

OTHER RECORDS:
1255'-1278' (382.9m-389.8m, Rec). 1280'-1320' (390.3m-402.6m, Cut 1)
1320'-1360' (402.6m-414.8m, Rec). 1360'-1400' (414.8m-426.9m, Cut 2)
1400'-1440' (426.9m-439.1m, Rec). 1440'-1480' (439.1m-451.3m, Cut 3)
1480'-1520' (451.3m-463.5m, Rec). 1520'-1560' (463.5m-475.7m, Cut 4)
1560'-1600' (475.7m-487.9m, Rec). 1600'-1640' (487.9m-500.1m, Cut 5)
1640'-1680' (500.1m-512.3m, Rec). 1680'-1720' (512.3m-524.4m, Cut 6)
1720'-1760' (524.4m-536.6m, Rec). 1760'-1800' (536.6m-548.8m, Cut 7)
4154'-4174' (1267.0m-1273.0m, Rec). 4174'-4194' (1273.0m-1280.1m, Cut 8)
4194'-4214' (1280.1m-1286.2m, Rec). 4214'-4234' (1286.2m-1292.3m, Cut 9)
4234'-4254' (1292.3m-1298.4m, Rec). 4254'-4274' (1298.4m-1304.5m, Cut 10)
4274'-4294' (1304.5m-1310.6m, Rec). 4294'-4314' (1310.6m-1316.7m, Cut 11)
4314'-4334' (1316.7m-1322.8m, Rec). 4334'-4354' (1322.8m-1328.9m, Cut 12)
4354'-4374' (1328.9m-1335.0m, Rec). 4374'-4394' (1335.0m-1341.1m, Cut

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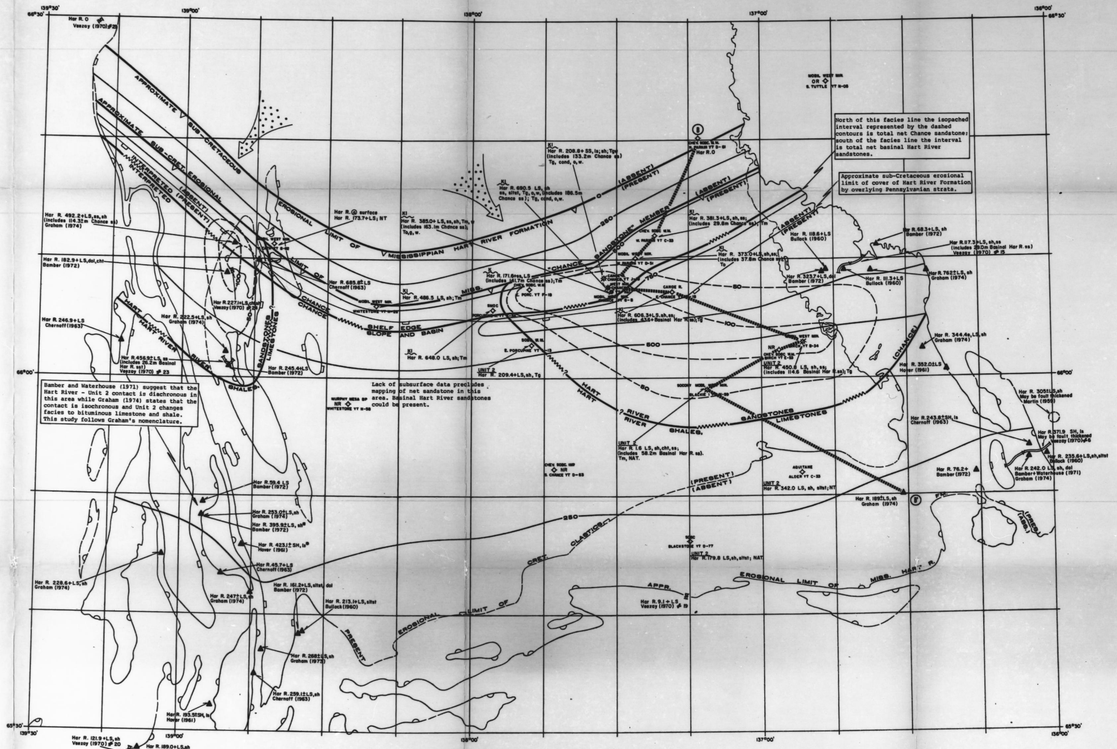
# STRATIGRAPHIC MAP OF THE HART RIVER FORMATION OF MISSISSIPPIAN AGE SOUTHERN EAGLE PLAIN

TOTAL FORMATION ISOPACH INTERVAL · 250 METERS (SOLID CONTOURS) CHANCE SANDSTONE AND TOTAL NET BASINAL SANDSTONE ISOPACH INTERVAL · 50 METERS (DASHED CONTOURS)

SCALE · 1: 250,000

This map shows the interpreted thickness, distribution, lithology and significant stratigraphic changes prior to Laramide deformation and subsequent erosion.


North of this facies line the isopached interval represented by the dashed contours is total net Chance sandstone; south of the facies line the interval is total net basinal Hart River sandstones.
Approximate sub-Cretaceous erosional limit of cover of Hart River Formation by overlying Pennsylvanian strata.
Rember and Waterhouse (1971) suggest that the Hart River - Unit 2 contact is diachronous in this area while Graham (1974) states that the contact is isochronous and Unit 2 changes facies to bituminous limestone and shale. This study follows Graham's nomenclature.
Lack of subsurface data precludes mapping of net sandstone in this area. Basinal Hart River sandstones could be present.
CRETACEOUS
MISSISSIPPIAN
HART RIVER FORMATION
CHANCE
SHALE
SHELF EDGE AND BASIN
CHANCE SANDSTONES
LIMIT OF MISSISSIPPIAN HART RIVER FORMATION
EROSIONAL LIMIT OF MISS. HART RIVER FM.
EROSIONAL LIMIT OF CRET. CHANCE SS.
PRESENT LIMIT OF CRET. CHANCE SS.
APPR. EROSIONAL LIMIT OF CRET. CHANCE SS.
LABERGE (PRESENT)
LABERGE (PRESENT)
LABERGE (PRESENT)
LABERGE (PRESENT)
BLACKSTONE
ALAMO
ALASKA
BLACKSTONE
ALAMO
ALASKA
BLACKSTONE
ALAMO
ALASKA